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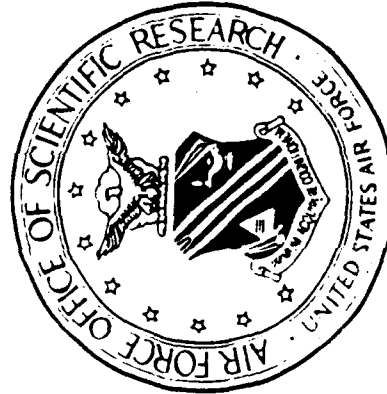
AFOSR-TR-89-0441

# AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

AIR FORCE SYSTEMS COMMAND

AFOSR

TECHNICAL REPORT SUMMARIES



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**AFOSR**

**TECHNICAL REPORT SUMMARIES**

**THIRD QUARTER 1988**

**PREPARED BY:**

**DEBRA L. TYRRELL, CHIEF**

**TECHNICAL DOCUMENTS SECTION**

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## INTRODUCTION

The Air Force Office of Scientific Research Technical Report Summaries are published quarterly as of March, June, September, and December of each calendar year. They consist of a brief summary of each AFOSR technical report received in the Technical Information Division and submitted to the Defense Technical Information Center (DTIC) for that quarter. The summaries contain two indexes for easily locating the technical reports that may be of interest to the user. These are followed by abstracts of the reports.

### 1) SUBJECT INDEX

- a. Subject Field
- b. Title of Report
- c. AD Number (Accession Number)

### 2) PERSONAL AUTHOR INDEX

- a. Primary Author
- b. Title of Report
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AFOSR awards grants and contracts for research in areas of science relevant to the needs of the Air Force. Research is selected for support from proposals received in response to the Broad Agency Announcement originating from scientists investigating problems involving the search for new knowledge and the expansion of scientific principles. Selection is on the basis of scientific potential for improving Air Force operational capabilities, originality, significance to science, the qualification of the principal investigators, and the reasonableness of the proposed budget.

## KEY TO READING THE DATA

The summaries consist of two indexes and the abstracts. From one of the two indexes, locate the AD number of the report that is of interest to you. Use this number to locate the abstract of the report in the abstracts section. The first report submitted to DTIC during the quarter (the one with the lowest AD number) appears on the last page of the abstracts section. The last report submitted to DTIC during the quarter (the one with the highest DTIC number) appears on the first page of the abstracts section. The following terms will give you a brief description of the elements used in each summary of this report.

DTIC Report Bibliography - DTIC's brief description of a technical report.

Search Control Number - A number assigned by DTIC at the time a bibliography is printed.

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Abstract - A brief summary describing the research of the report.

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Utilization of a Single Clear-Air Doppler Radar Beam to Measure Vertical Divergence.  
AD-A195543 REPORT DATE: 23 MAR 88 FINAL REPORT

Variance Function Estimation.  
AD-A194012 REPORT DATE: DEC 87 ANNUAL REPORT

Vibration Control of Large Structures.  
AD-A193317 REPORT DATE: 01 MAR 88 FINAL REPORT

Vibrational Overlap Integrals between the Neutral and Ion States of NH3 and ND3: Application to the Vibrational Dependence of the NH3+(v2) + NH3(0) Symmetric Charge Transfer Reaction.  
AD-A193950 REPORT DATE: 87 ANNUAL REPORT

Visual Motion Perception and Visual Attentive Processes.  
AD-A193840 REPORT DATE: APR 88 FINAL REPORT

Weak Solution of the Langevin Equation on a Generalized Functional Space.  
AD-A194290 REPORT DATE: FEB 88 FINAL REPORT

29Si Nuclear Magnetic Resonance of Dialkylpolysilanes.  
AD-A194130 REPORT DATE: 88 FINAL REPORT

29Si Nuclear Magnetic Resonance of Dimethyl and Phenylmethyl Containing Polysilanes.  
AD-A194129 REPORT DATE: 88 FINAL REPORT

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-B122 387L 7/2 20/3

AD-B122 387L CONTINUED

ADVANCED MATERIALS CORP PITTSBURGH PA

CRYOGENICS, ENERGY, HIGH TEMPERATURE, LIGHTWEIGHT, LOW TEMPERATURE, RANGE(EXTREMES), TEMPERATURE, TORQUE.

(U) Low-Cost, Lightweight, High Torque Motors for Applications over a Wide Temperature Range.

IDENTIFIERS: (U) PE81102F, WUAFOSRK822L1.

DESCRIPTIVE NOTE: Final rept. 30 Sep 87-31 Mar 88.

MAY 88

PERSONAL AUTHORS: Sankar, S. G.; Pourarian, F.; Wallace, W. E.

CONTRACT NO. F49620-87-C-0084

PROJECT NO. K822

TASK NO. L1

MONITOR: AFOSR  
TR-88-0597

UNCLASSIFIED REPORT

Distribution authorized to DoD only; Critical Technology; 30 Jun 88. Other requests must be referred to AFOSR/NE, Bldg. 10, Bolling AFB, Washington, DC 20332-8448.

ABSTRACT: (U) Permanent magnets based on the composition Pr-Fe-B have been fabricated. The B-H loops have been determined at 4.2, 77, 273 K and at higher temperatures up to 425 K. These magnets typically exhibited a remanence Br of 14.5 and 14.3 kG and a maximum energy product of 51.1 and 49.9 MGOe at 4.2 and 77 K, respectively. These characteristics are superior to any other magnet composition commercially available (such as Nd-Fe-B, SmCo5 or Sm2Co17 compositions) and tested in our laboratory. The occurrence of spin-reorientation phenomena in Nd-Fe-B magnets is considered partly responsible for its inferior properties. Sm-Co magnets intrinsically lack comparable remanence. For aerospace applications, where the devices fabricated from permanent magnets are required to operate at cryogenic temperatures, the above finding has a tremendous significance. Keywords: Permanent magnets, Motors, Iron Boron, Praseodymium. (mjm)

DESCRIPTORS: (U) \*BORON, \*IRON, \*MAGNETS, \*MOTORS, \*PERMANENT MAGNETS, \*PRASEODYMIUM, AEROSPACE SYSTEMS.

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AD-8121 754L 12/8

ARITHMETIKA INC NEW YORK

(U) Design and Implementation of High-Precision and High-Performance Parallel Software and Hardware.

DESCRIPTIVE NOTE: Final rept. 15 Aug 87-15 Feb 88,

APR 88

PERSONAL AUTHORS: Chudnovsky, David V.; Chudnovsky, Gregory V.

REPORT NO. F1-88

CONTRACT NO. F49620-87-C-0089

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-88-0404

UNCLASSIFIED REPORT

Distribution authorized to U.S. Gov't. agencies only; Software Documentation; Proprietary Info.; 3 May 88. Other requests must be referred to Air Force Office of Scientific Research, Attn: NW, Bolling AFB, Washington, DC 20332-6488.

ABSTRACT: (U) The efforts of Arithmetika, Inc. in the Phase I feasibility study were concentrated on the design of processing and switching elements, and hardware and software simulation of a parallel supercomputer. The goal of the project is to provide scientists, and defense and business specialists with inexpensive supercomputers exceeding the performance of current machines. The line of M1 computers, built on modular principles, can satisfy a variety of computing needs, with a variety of machines, from fast serial single user machines of a PC/workstation size to large, powerful parallel machines that will be particularly effective for the solution of large numerically intensive problems arising in science, engineering, modeling and design, live image processing, and defense simulation and development. The heart of the M1 system are designed high performance PEs and switching chips supporting flexible, general purpose

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AD-8121 754L CONTINUED

Intercommunications. Phase I efforts determined the optimal architectural principles, basic word size and arithmetic of the PEs and the structure of the switching network and switching elements. Keywords: Parallel computing, VLSI, High-precision computations, Very large scale integration.

DESCRIPTORS: (U) \*PARALLEL PROCESSING, \*SUPERCOMPUTERS, \*SYSTEMS ENGINEERING, COMPUTATIONS, COMPUTER PROGRAMS, COMPUTERIZED SIMULATION, DEFENSE SYSTEMS, FEASIBILITY STUDIES, IMAGE PROCESSING, INTEGRATION, MACHINES, NETWORKS, OPTIMIZATION, PERFORMANCE(ENGINEERING), PHASE, PRECISION, SIMULATION, SIZES(DIMENSIONS), SWITCHING, SWITCHING CIRCUITS, WORDS(LANGUAGE), COMPUTER ARCHITECTURE.

IDENTIFIERS: (U) M1 Supercomputers, \*Parallel supercomputers, WUAFDSR3005A1, PES1102F.

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AD-B121 737L 14/2 CONTINUED

INTELLIGENT SYSTEMS INTEGRATION INC ALBUQUERQUE NM

(U) Development of a High Imaging-Speed Scanning Electron Microscope for Dynamically Loaded Materials. Phase 1.

DESCRIPTIVE NOTE: Final Rept. Jul 87-Jan 88.

FEB 88 31P

PERSONAL AUTHORS: Ross, T.; Wang, M.; Mackinnon, I.; Fishbine, B.

CONTRACT NO. F49620-87-C-0082

PROJECT NO. 3006

TASK NO. A1

MONITOR: AFOSR  
TR-88-0454

UNCLASSIFIED REPORT

Distribution authorized to U.S. Gov't. agencies only; Proprietary Info.; 3 May 88. Other requests must be referred to Air Force Office of Scientific Research, AFOSR/NA, Bolling AFB, DC 20332.

ABSTRACT: (U) The ability to monitor real-time microstructural dynamic processes of materials in environments such as thermal shock or external impact requires instrumentation that does not currently exist. Scanning electron microscopy could have this capability if scanning rates were sufficiently high to illuminate, magnify and record the process and if the SEM itself could be isolated from the dynamic loads. This report documents SBIR Phase I progress on this problem by considering three primary areas of requirements in the development phase of a high imaging speed SEM: (a) specimen and loading, (b) illumination and magnification, and (c) image collection and processing. The opinions and recommendations provided in this report are the result of some laboratory tests, some analysis, and an extensive canvassing of the world-wide electron microscopy community. Keywords: Scanning electron microscopy, Shock, Impulse, Dynamic material effects.

DESCRIPTORS: (U) \*DYNAMIC LOADS, \*ELECTRON MICROSCOPY,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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MARYLAND UNIV COLLEGE PARK

(U) Parallel Logic Programming and ZMOB.

DESCRIPTIVE NOTE: Final rept. 30 Jun 82-13 Feb 88.

APR 88

PERSONAL AUTHORS: Winker, Jack; Weiser, Mark

CONTRACT NO. AFOSR-82-0303

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-88-0562

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report presents a summary of research accomplished to investigate parallel problem solving. Under the current grant a parallel problem solving system, PRISM (Parallel Inference System), that was implemented on the VAX/11-780, the PYRAMID and SUN machines, was ported successfully to McMOB and then to the BBN Butterfly parallel architecture. The McMOB architecture is essentially the ZMOB architecture with 16 Motorola 68000 processors, upgrading the Z80A microprocessors, interconnected in a ring structure. Experimental testing of PRISM on McMOB was undertaken in the current year. In addition, several enhancements were made to PRISM to permit experimental analyses to be made, and to incorporate additional features to take full advantage of parallelism in a problem solving environment. The tracing and statistical gathering packages were extended. An ability to display AND-parallelism was added to the trace program which displays the execution of a program on the parallel machines. In addition to the above, work continued in the area of informative answers to be presented to a user. Heuristic techniques were developed to determine which information to display. Keywords: Splicing compilers, Debugging software, Artificial intelligence. (KR)

DESCRIPTORS: (U) \*COMPUTER PROGRAMMING, \*PARALLEL PROCESSING, ARTIFICIAL INTELLIGENCE, COMPILERS, COMPUTER

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PROGRAMS, DEBUGGING(COMPUTERS), ENVIRONMENTS, HEURISTIC METHODS, LOGIC, MACHINES, PROBLEM SOLVING, RINGS, SPLICES.

IDENTIFIERS: (U) PE81102F, MUAFOSR2304A7, (PRISM Parallel Inference System).

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A196 938 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

Supersonic flow; Experiments; Flow visualization; Fluid  
dynamics; Flow separation. (EDC)

(U) Experimental Research on Swept Shock Wave/Boundary  
Layer Interactions.

DESCRIPTORS: (U) \*JET FLOW, \*SHOCK WAVES, \*TURBULENT  
BOUNDARY LAYER, COMPUTATIONS, DIAGNOSIS(GENERAL),  
EXPERIMENTAL DESIGN, FINS, FLIGHT, FLOW FIELDS, FLOW  
SEPARATION, FLOW VISUALIZATION, FLUID DYNAMICS, HIGH  
VELOCITY, IMPINGEMENT, INTERACTIONS, INVISCID FLOW, LASER  
APPLICATIONS, LEADING EDGES, MEASUREMENT, OPTICAL  
ANALYSIS, MATHEMATICAL PREDICTION, REFRACTION, SKIN  
FRICTION, STRUCTURAL PROPERTIES, SUPERSONIC FLOW,  
SURFACES, VARIATIONS, VEHICLES, VISCOUS FLOW, OPTICAL  
INTERFEROMETERS.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 87-31 Mar 88,

APR 88 58P

PERSONAL AUTHORS: Settles, Gary S.

REPORT NO. PSU-ME-R-87/88-0031

CONTRACT NO. AFOSR-86-0082

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-88-0637

IDENTIFIERS: (U) PEG1102F, WJAFOSR2307A1, Swept shock  
waves.

UNCLASSIFIED REPORT

ABSTRACT: (U) This study of swept shock wave  
interactions with turbulent boundary layers relied  
entirely on non-intrusive, laser-based optical flow  
diagnostics. Experiments were carried out to define the  
flowfield structure of fin-generated interactions over a  
Mach number range 2.5 to 3.5 using the laser light-screen  
flow visualization technique. Further experiments  
resulted in accurate skin friction measurements in fin-  
generated swept interactions by way of the Laser  
Interferometer Skin Friction Meter. Techniques were  
perfected for the assessment of flowfield fluctuation  
levels using pulsed-laser holographic interferometry. The  
results of this research have given new insight into the  
fin-interaction flowfield structure, which involves a  
supersonic jet produced by shock wave refraction and  
impinging on the test surface. High skin friction levels  
were measured in the vicinity of this jet impingement,  
which compare well with computational predictions carried  
out by others. Finally, the observed jet impingement  
structure is shown to be similar to that of leading-edge  
shock wave impingement on high-speed flight vehicles.  
Keywords: Experimental design; High-speed flows; Viscous-  
inviscid interactions; Shock-boundary layer interactions;

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AT AND T BELL LABS HOLMDEL NJ

(U) Hot Carriers in Semiconductors: Proceedings of the International Conference (5th) Held in Boston, Massachusetts on 20-24 July 1987.

DESCRIPTIVE NOTE: 1ST EDITION.

88 527P

PERSONAL AUTHORS: Shah, V.; Iafrate, G. J.

CONTRACT NO. N00014-87-G-0129, AFOSR-MIPR-87-0036

MONITOR: AFOSR, ARD  
TR-88-0701, 24774. 1-EF-CF

UNCLASSIFIED REPORT

Availability: Pub. in Solid-State Electronics, v31 n3/4 p319-820 1988. Pergamon Press Customer Services, Elmsford, NY 10523 HC \$95.00 (No copies sold by DTIC/NTIS).

SUPPLEMENTARY NOTE: Supported in part by DAAL03-87-G-0112.

ABSTRACT: (U) Several major areas of current research activities in the field of Hot Carriers may be identified from the program of this conference. The ability to grow high quality micro- and nano- structures using MBE and other techniques has given a tremendous boost to experimental as well as theoretical activity in this area. In addition to hot carrier effects in heterostructures and quantum wells, I include in this area the exciting new work on ballistic transport, and tunneling and perpendicular transport in superlattices. The second major area that I recognize is the use of recently developed femtosecond lasers in investigating transient hot carrier effects on femtosecond timescales. The experimental activities in this field are being complemented by theoretical studies and calculations. The third major area is a natural consequence of the two above; quantum transport theory is required to understand many of the phenomena that occur on ultrasmall spatial scales and ultrafast time scales. Other aspects that will be discussed at this Conference include far infrared studies, carrier-carrier interactions, hot phonons, novel devices and their simulations, magnetotransport and impact ionization. I believe that is an exciting program fully

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representative of the many exciting activities in this field. I am looking forward to many stimulating presentations and discussions. (ajm)

DESCRIPTORS: (U) \*CHARGE CARRIERS, \*SEMICONDUCTORS, \*TRANSPORT PROPERTIES, BALLISTICS, FAR INFRARED RADIATION, HIGH ENERGY, IMPACT, INTERNATIONAL, IONIZATION, LASERS, PHONONS, QUANTUM ELECTRONICS, SYMPOSIA, TRANSIENTS, TRANSPORT.

IDENTIFIERS: (U) Quantum.

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AD-A196 887 CONTINUED

MICHIGAN STATE UNIV EASY LANSING TURBULENCE STRUCTURE  
LAB

IDENTIFIERS: (U) WJAFOSR2307A2, PE81102F.

(U) A Study of Turbulence Production Using a New  
Photochromic Visualization Technique.

DESCRIPTIVE NOTE: Annual rept. 1 Oct 88-1 Oct 87.

APR 88 158P

PERSONAL AUTHORS: Falco, R. E.; Chu, C. C.

REPORT NO. TSL-88-2

CONTRACT NO. AFOSR-87-0047

MONITOR: AFOSR  
TR-88-0814

UNCLASSIFIED REPORT

ABSTRACT: (U) The new technique of Laser Induced Photochemical Anemometry (LIPA) has been developed to enable measurement of the evolution of coherent structures involved in the turbulent production process. Results are reported showing the measurement of the streamwise and transverse vorticity component and the strain rate as well as the Reynolds stresses at large numbers of points in a chosen plane. Calibration depends only on a time and a length scale. Comparison of measurements with the exact solution in a Stokes' layer indicates that the technique's accuracy can be predicted by classical error analysis and that it is comparable or better than that achievable with the best single point probe techniques. The results show the relative importance of streaks, pockets and hairpins that are generated in the vortex ring/wall simulation of the turbulence production process. Keywords: Turbulence; Boundary layer; Flow visualization. (mjm)

DESCRIPTORS: (U) \*PHOTOCROMIC MATERIALS, \*TURBULENCE, ACCURACY, BOUNDARY LAYER, CALIBRATION, COHERENCE, COMPARISON, ERROR ANALYSIS, FLOW VISUALIZATION, LASER ANEMOMETERS, LAYERS, LENGTH, MEASUREMENT, MOMENTUM TRANSFER, PHOTOCHEMICAL REACTIONS, PROBES, PRODUCTION, RINGS, SCALE, SIMULATION, STRAIN RATE, STRESSES, STRUCTURES, TRANSVERSE, VISUAL INSPECTION, VORTICES, WALLS.

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AD-A196 879 CONTINUED

SRI INTERNATIONAL MENLO PARK CA

(U) The Use of Laser-Powered Homogeneous Pyrolysis to Determine the Initial Steps in the Homogeneous Gas-Phase Decomposition of Cyclic Nitramines.

DESCRIPTORS: (U) \*LASERS, \*NITRAMINES, ARRHENIUS EQUATION, DECOMPOSITION, DETECTION, HOMOGENEITY, METHYL RADICALS, NITROSAMINES, PYROLYSIS, QUANTUM STATISTICS, QUANTUM THEORY, REACTION KINETICS, SCALE, SECONDARY, TIME, VAPOR PHASES.

DESCRIPTIVE NOTE: Final rept. 1 Jan 85-31 Dec 87,

IDENTIFIERS: (U) PE81102F, WJAF0SR2303B1, LPN-SRI-PYU-8232.

APR 88 113P

PERSONAL AUTHORS: McMillen, Donald F.; Stewart, Paul H.; Nigenda, S. E.; Jeffries, Jay B.; Zellweger, Jean-Michel

CONTRACT NO. F49620-85-K-0006

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-88-0808

UNCLASSIFIED REPORT

ABSTRACT: (U) As a prototype for more complex nitramines, the gas-phase decomposition of dimethylnitramine has been studied experimentally in two different laser-pyrolysis systems and theoretically using ab initio quantum mechanical calculations. Our studies, unlike those reported in the literature, indicate that a nitro-nitrite rearrangement pathway is competitive with the expected (and previously invoked) N-NO2 bond scission. This rearrangement pathway has been obscure because it can lead to some of the same products as are yielded by the bond scission route. The principal evidence for nitro-nitrite rearrangement is (1) Arrhenius parameters for decomposition that are two orders of magnitude too low to be consistent with simple N-NO2 bond scission as the sole rate-determining step; (2) molecular-beam, mass-spectrometrically-sampled laser pyrolysis studies that show direct detection of NO and the nitroxy radical (CH3)2NNO on a time scale too short to allow for the production of these substances in secondary bimolecular reactions; and (3) ab initio calculations that find a rearrangement pathway at slightly lower energy than that of simple bond scission. Keywords: Synthesis(Chemistry), Gas phase decomposition, Cyclic nitramines, Dimethylnitrosamine, Dimethylnitramine. (jes)

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AD-A196 825 15/6.3 8/15

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MATERIALS  
SCIENCE AND ENGINEERING

GLASGOW UNIV (SCOTLAND)

(U) New Non-Linear Optical Polymers.

(U) The Effects of Anticholinesterases and Atropine  
Derivatives on Visual Function in Human Subjects.

DESCRIPTIVE NOTE: Final rept. 1 Sep 85-31 Dec 87.

DESCRIPTIVE NOTE: Final rept..

JUN 88 112P

FEB 88 198P

PERSONAL AUTHORS: Wnek, Gary E.

PERSONAL AUTHORS: Morrison, James D.; Kay, Christine D.

CONTRACT NO. F49620-88-C-0151

CONTRACT NO. AFOSR-84-0010

PROJECT NO. 2303

PROJECT NO. 2313

TASK NO. A3

TASK NO. A5

MONITOR: AFOSR  
TR-88-0688MONITOR: AFOSR  
TR-88-0462

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The synthesis of a new monomer, N,N-diaminoethyl-4-nitroaniline (DANA), which will be condensed with various diacyl halides to yield polyamides with interesting optical properties was achieved. Several compounds containing potentially 'electrically leaky' atoms between donor (amino) and acceptor (nitro) moieties was prepared. The key finding is that the sulfide is extremely NLO-active. Keywords: Synthesis(Chemistry); Optical materials; Polymers; Diamines; Thalimides; Dichlorides; Nitroaniline. (jes)

DESCRIPTORS: (U) \*OPTICAL PROPERTIES, \*POLYMERS, AMINES, ATOMS, MONOMERS, NONLINEAR SYSTEMS, OPTICAL MATERIALS, POLYAMIDE PLASTICS, SYNTHESIS(CHEMISTRY), POLYETHERS, CHROMOPHORES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

ABSTRACT: (U) This project has been concerned with the action of anticholinesterases on vision and the degree of antagonism by atropine sulphate. The main test of visual function was the measurement of contrast sensitivity for the detection of a sine wave grating pattern of specified spatial frequency. The following experiments were undertaken on volunteer subjects, with their informed consent. Keywords: Pupils, Pyridostigmine, Organophosphates, Prophylactics, Preventive medicine. (kt)

DESCRIPTORS: (U) \*CHOLINESTERASE INHIBITORS, \*VISION, ATROPINE, CONTRAST, DETECTION, FREQUENCY, GRATINGS(SPECTRA), MEASUREMENT, ORGANOPHOSPHATES, PATTERN RECOGNITION, PREVENTIVE MEDICINE, SENSITIVITY, SINE WAVES, SPATIAL DISTRIBUTION, STUDENTS, SULFATES, TEST AND EVALUATION, VOLUNTEERS.

IDENTIFIERS: (U) WUAFOSR2312A5, PE61192F, Pyridostigmine, Side effects, Pupils, Contrast sensitivity.

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CORNELL UNIV ITHACA NY SCHOOL OF ELECTRICAL ENGINEERING

(U) Computer Aided Design of Monolithic Microwave and Millimeter Wave Integrated Circuits and Subsystems.

DESCRIPTIVE NOTE: Final technical rept. 1 Sep 84-31 Dec 88.

MAY 88 69P

PERSONAL AUTHORS: Ku, Walter H.; Gang, Guan-Man; Ho, J. Q.; Ichitsubo, I.

CONTRACT NO. AFOSR-84-0345

PROJECT NO. 2305

TASK NO. C1

MONITOR: AFOSR  
TR-88-0832

## UNCLASSIFIED REPORT

ABSTRACT: (U) This final technical report presents results on the computer aided design of monolithic microwave and millimeter wave integrated circuits and subsystems. New results include analytical and computer aided device models of GaAs MESFETs and HEMTs or MODFETs, new synthesis techniques for monolithic feedback and distributed amplifiers and a new nonlinear CAD program for MIMIC called CADNON. This program incorporates the new MESFET and HEMT model and has been successfully applied to the design of monolithic millimeter-wave mixers. Keywords: GaAs MESFETs, HEMTs, MODFETs, Monolithic microwave and millimeter integrated circuits, MIMIC, MIMIC, Computer aided design, and Large-signal device models. (r.h.)

DESCRIPTORS: (U) \*INTEGRATED CIRCUITS, COMPUTER AIDED DESIGN, DISTRIBUTED AMPLIFIERS, MILLIMETER WAVES, SYNTHESIS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2305C1.

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UNIVERSITY OF MANCHESTER INST OF SCIENCE AND TECHNOLOGY (ENGLAND) DEPT OF PUR E AND APPLIED PHYSICS

(U) A Study of the Identification and Development of Precipitation Using Dual Polarization Radar.

DESCRIPTIVE NOTE: Final scientific rept. 1 Jul 86-31 Dec 87.

JAN 88

PERSONAL AUTHORS: Illingworth, Anthony J.

CONTRACT NO. AFOSR-86-0193

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-88-0683

## UNCLASSIFIED REPORT

ABSTRACT: (U) This final report describes work performed with the Chilbolton dual polarization radar under contract number AFOSR-86-0193. In addition to measuring the conventional radar reflectivity factor, Z, this radar can measure the differential reflectivity, ZDR, which senses the shape of the precipitation particles. ZDR may be used to differentiate water from ice, to measure the mean size of raindrops and to provide more accurate estimates of rainfall rates. This report is divided into five self-contained parts, each with its own set of diagrams and references. The first four parts consider analysis of Z and ZDR data obtained in 1983 and 1984; the final part describes the first results of a new parameter observed with the reconfigured radar in the fall of 1987. (r.h.)

DESCRIPTORS: (U) \*ICE, \*POLARIZATION, \*RADAR, \*RADAR REFLECTIONS, \*RAINDROPS, DIAGRAMS, ESTIMATES, IDENTIFICATION, MEAN, PARAMETERS, PARTICLES, PARTS, PRECIPITATION, RAINFALL INTENSITY, RATES, REFLECTIVITY, SELF CONTAINED, SIZES(DIMENSIONS), WATER.

IDENTIFIERS: (U) WUAFOSR2310A1, PE61102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A196 870 CONTINUED

AD-A196 870 20/12 20/2  
OREGON STATE UNIV CORVALLIS DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

tellurides.

(U) Point Defects in Semiconductors: Microscopic  
Identification, Metastable Properties, Defect  
Migration, and Diffusion.

DESCRIPTIVE NOTE: Annual rept. 31 Aug 88-28 Feb 88.

APR 88 5P

PERSONAL AUTHORS: Van Vechten, James A.; Wager, John F.

CONTRACT NO. AFOSR-88-0308

PROJECT NO. 2306

TASK NO. B1

MONITOR: AFOSR  
TR-88-0888

UNCLASSIFIED REPORT

ABSTRACT: (U) Fundamental progress is made in the  
identification of point defect complexes in  
semiconductors (particularly EL2 and ELO in GaAs), the  
elucidation of the mechanisms by which they migrate  
(particularly re vacancy nearest neighbor hopping in  
compound semiconductors and recombination enhanced  
migration of vacancies in Si), and the development of an  
efficient means to simulate their detailed, and very  
complicated, diffusion and inter-reaction on a  
microcomputer using an innovative (and evidently unique)  
Monte Carlo method. Some effort has also recently gone  
into the elucidation of the temperature dependence of  
band off sets at heterojunctions, particularly GaAs-AlAs  
and HgTe-CdTe. Keywords: Cadmium telluride; Mercury  
telluride; Gallium arsenide; Aluminum arsenide. (JMD)

DESCRIPTORS: (U) \*POINT DEFECTS, \*CRYSTAL STRUCTURE,  
\*SEMICONDUCTOR JUNCTIONS, ALUMINUM ARSENIDES, CADMIUM  
TELLURIDES, GALLIUM ARSENIDES, DIFFUSION, IDENTIFICATION,  
MERCURY COMPOUNDS, METASTABLE STATE, MICROCOMPUTERS,  
MICROSCOPY, MIGRATION, MONTE CARLO METHOD, SEMICONDUCTORS,  
TELLURIDES, THERMAL PROPERTIES.

IDENTIFIERS: (U) MUAFOSR2308B1, PE81102F, Mercury

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## DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A196 829 20/4

## VISUAL AERODYNAMICS TORRANCE CA

(U) An Innovative Approach to Nonintrusive Quantitative Measurements of Vortex Flows.

DESCRIPTIVE NOTE: Final rept. Jan-Dec 87.

FEB 88 43P

PERSONAL AUTHORS: Malcolm, Gerald M.; Lewis, Liane C.; Ayers, Bert F.; Goldfarb, Daniel M.

PROJECT NO. 2307

TASK NO. A3

MONITOR: AFOSR  
TR-88-0403

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) A unique flow measurement technique was used to obtain quantitative vortex flow field data. This demonstration demonstrated that a video based data acquisition system, Expertvision, could be used to measure the velocity of flow through some parts of the flow field. The system systematically tracks packets of colored dye ejected from the models into there surrounding flow fields and then subsequently reduces the data to position, velocity and acceleration measurements for individual vortex cores. Vortex core data were collected for 70 and 80 degree delta wing models with both stationary and forced roll oscillation roll measurement. Keywords: Flow visualization, Flow measurement, Vortex flow. (jhd)

DESCRIPTORS: (U) \*FLOW FIELDS, \*FLOW VISUALIZATION, \*MEASUREMENT, \*VORTICES, ACCELERATION, CORES, DYES, DATA ACQUISITION, POSITION(LOCATION), VELOCITY.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2307A3.

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## HARRIS CORP MELBOURNE FL

(U) Optimal Output Feedback for Non-Zero Set Point Regulation: The Discrete-Time Case.

DESCRIPTIVE NOTE: Journal article.

88 9P

PERSONAL AUTHORS: Haddad, Wassim M.; Bernstein, Dennis S.

CONTRACT NO. F49620-86-G-0002

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0535

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Jnl. of Control, v47 n2 p529-538 1988.

ABSTRACT: (U) Optimal discrete time static output feedback is considered for a non-zero set point problem with nonzero mean disturbances. The optimal control law consists of a closed loop component for feeding back the measurements and a constant open loop component which accounts for the non-zero set point and non-zero disturbance mean. An additional feature is the presence of state control, and measurement dependent white noise. It is shown that in the absence of multiplicative disturbances, the closed loop controller can be designed independently of the open loop control. Reprints. (jha)

DESCRIPTORS: (U) \*CONTROL THEORY, \*FEEDBACK, CLOSED LOOP SYSTEMS, CONTROL, DISCRETE DISTRIBUTION, MEAN, MEASUREMENT, MULTIPLICATION FACTOR, OPEN LOOP SYSTEMS, OPTIMIZATION, OUTPUT, REGULATIONS, REPRINTS, TIME, WHITE NOISE.

IDENTIFIERS: (U) WUAFOSR2304A1, PEB1102F, Nonzero set point problem.

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI46A

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CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB

CALIFORNIA UNIV IRVINE DEPT OF PHARMACOLOGY

(U) Optimization-Based Design of Control Systems.

(U) Neuronal Mechanisms of Intelligence.

DESCRIPTIVE NOTE: Final rept. a31 Jul 88-30 Jul 87,

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-30 Sep 87,

APR 88

4P

MAR 88 2P

PERSONAL AUTHORS: Polak, Elijah

PERSONAL AUTHORS: Stein, Larry

CONTRACT NO. AFOSR-86-0247

CONTRACT NO. AFOSR-87-0019

PROJECT NO. 2917

PROJECT NO. 2917

TASK NO. A5

TASK NO. A4

MONITOR: AFOSR  
TR-88-0542MONITOR: AFOSR  
TR-88-0538

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) A DEC MicroVax II GPX Color workstation has been acquired for experimentation with the DELIGHT. MIMO interactive software system in the solution of optimal, worst case design of multivariable control systems. A SUN workstation - based system has been expanded for experiments in distributed computing for the optimal, integrated design of flexible structures and their control systems. Keywords: Computer aided design; Computer architecture; Man machine systems; Systems engineering. (kr)

ABSTRACT: (U) Equipment Acquired is described. All equipment has been used for on-line experimental control, data collection, and data analysis functions. In this work, we are investigating the adaptive rules used by mammalian brain cells in the mediation of intelligent behavior. The research is based on the assumption that human intelligence has evolved from the goal-seeking brain functions of lower forms, and that these functions in turn depend on a capacity for behavior to be strengthened or rewarded by its consequences (positive reinforcement). We furthermore assume that positive reinforcement of the intact organism is physiologically mediated at the level of the single neuron, rather than at the level of the multi-neuronal assembly or network. The equipment is being used in the performance of experiments designed to investigate whether individual cellular activity can be reinforced by locally applied electrical or chemical stimulation, and, reinforcements. Experiments are being conducted on single neurons in cell culture, brain tissue slices, and intact brain. The instrumentation enabled us to investigate modification of ionic channels and cellular biochemistry related to reinforcement. In addition, the equipment was used for detailed data analysis and computer modeling. (kt)

DESCRIPTORS: (U) \*COMPUTER AIDED DESIGN, \*CONTROL SYSTEMS, \*SYSTEMS ENGINEERING, COLORS, COMPUTER ARCHITECTURE, FLEXIBLE STRUCTURES, INTEGRATED SYSTEMS, MAN MACHINE SYSTEMS, MULTIVARIATE ANALYSIS, OPTIMIZATION.

IDENTIFIERS: (U) WUAFOSR2917AS, PE81102F.

DESCRIPTORS: (U) \*ADAPTIVE SYSTEMS, BIOCHEMISTRY, BRAIN, CELLS, CELLS(BIOLOGY), CHEMICALS, COMPUTERIZED SIMULATION,

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CONTROL, CULTURES(BIOLOGY), CYTOLOGY, DATA ACQUISITION,  
DATA PROCESSING, ELECTRIC CURRENT, FUNCTIONS, HUMANS,  
INTELLIGENCE, MAMMALS, NERVE CELLS, ON LINE SYSTEMS,  
STIMULATION(GENERAL), TISSUES(BIOLOGY).

TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER  
APPLICATIONS

(U) Laser-Sustained Plasma in Forced Argon Convective Flow.  
Part 1. Experimental Studies.

IDENTIFIERS: (U) WUAFOSR2917A4, PEG1102F.

AUG 87 9P

PERSONAL AUTHORS: Welle, R.; Keefe, D.; Peters, C.

CONTRACT NO. AFOSR-86-0317

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0520

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in AIAA (American Institute of  
Aeronautics and Astronautics) Jnl., v25 n8 p1093-1099 Aug  
87.

ABSTRACT: (U) The results of an experimental  
investigation of the properties of laser-sustained  
plasmas in argon at forced convective flow speeds of 0.4-  
4.5 m/s are reported in this paper. At these speeds, the  
incident flow rate has a significant effect on the shape,  
size and position of the plasma, which in turn affect the  
power absorption, thermal radiation, and total energy  
conversion efficiency of the plasma. In addition to the  
incident flow rate, the focusing geometry, chamber  
pressure, and laser power were varied as parameters in  
the experiments. The thermal conversion efficiency was  
found to range 9-38%, depending on the various parameters.  
Keywords: Argon; Convective; Radiation; Conversion;  
Parameters; Laser sustained plasmas; Reprints. (mjm)

DESCRIPTORS: (U) \*ENERGY CONVERSION, \*PLASMAS(PHYSICS),  
ABSORPTION, ARGON, CONVECTION, EFFICIENCY, EXPERIMENTAL  
DATA, FLOW, FLOW RATE, LASERS, REPRINTS, THERMAL  
RADIATION, VELOCITY.

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CALIFORNIA INST OF TECH PASADENA GRADUATE AERONAUTICAL  
LABS

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the mixing rate, numerical values of the Damkoehler number are proposed to quantify fast and slow chemistry regimes. (edc)

(U) The Effects of Damkoehler Number in a Turbulent Shear Layer.

88 14P

PERSONAL AUTHORS: Mungal, M. G.; Frieler, C. E.

CONTRACT NO. AFOSR-83-0213

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-88-0543

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Combustion and Flame, v71 p23-34 1988.

ABSTRACT: (U) A chemical reaction for which the reaction rate can be varied is studied in a fully developed, two-dimensional, turbulent mixing layer. The layer is formed between two nitrogen streams, one carrying low concentrations of fluorine and the other hydrogen and nitric oxide. For fixed concentrations of fluorine and hydrogen and for nitric oxide concentrations that are small fractions of the fluorine concentration, the heat release is fixed but the overall reaction rate is controlled by the nitric oxide concentration. Therefore, for fixed flow conditions, the nitric oxide concentration determines the ratio of the reaction rate to the mixing rate and hence a Damkoehler number. For large values of this ratio, the amount of product, at a given downstream location, measured by the mean temperature rise, is independent of the reaction rate, i.e., the reaction is mixing limited. As the reaction rate is reduced and the amount of product declines, other effects are: 1) the mean temperature profile, which is initially somewhat unsymmetrical because the hydrogen-fluorine freestream concentration ratio is set at a large value, becomes symmetrical; and 2) the ramplike instantaneous temperature traces within the large structure gradually become more like square waves. Based upon two choices for

DESCRIPTORS: (U) \*TURBULENT FLOW, \*REACTION KINETICS, CHEMICAL REACTIONS, CHEMISTRY, CONCENTRATION(CHEMISTRY), FLOW, FLUORINE, HEAT, HYDROGEN, LAYERS, MEAN, MIXING, NITROGEN, NITROGEN OXIDES, PROFILES, RATES, RATIOS, REACTION TIME, RELEASE, SHEAR PROPERTIES, SQUARE WAVES, TEMPERATURE, TURBULENCE, TWO DIMENSIONAL FLOW, HEAT OF REACTION.

IDENTIFIERS: (U) Damkoehler number, Nitric oxide, Reaction rate, Turbulent mixing flow, Mixing rate, PEB1102F, WJAFOSR2308A2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV148A

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OREGON GRADUATE CENTER SEAVERTON DEPT OF COMPUTER  
SCIENCE AND ENGINEERING

(U) Constructive Negation in Logic Programs.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 87,

87 4P

PERSONAL AUTHORS: Hamlet, Richard

CONTRACT NO. AFOSR-87-0064

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-88-0514

UNCLASSIFIED REPORT

ABSTRACT: (U) This work lays solid groundwork for systematic study of negation in logic programming that preserves the declarative nature of the languages like pure PROLOG, can be efficiently executed without major changes to present interpreters, and allows programs to retain their constructive solutions. Transformation of positive predicates into their negative duals can introduce universal quantification in the body of the defining clause. Constructive implementation of universal quantifiers in general requires unbounded searches, but in an important subcase implementation is practical. Frequently, the universally quantified formula is an implication, allowing the antecedent to filter instantiations of the consequent. The SLD resolution procedure was modified to handle this situation, and explored circumstances under which the resulting executions are practical. Logic programming is declarative, but its programs can be executed relatively efficiently. This balance is a precarious one: languages with a more imperative nature are much faster in execution, but programming is more difficult; if the declarative expressiveness of the language is extended, its execution can become so slow that it is unusable. The languages typified by 'pure' PROLOG strike this balance on the side of efficiency, by fixing on SLD resolution as the execution algorithm. The Horn-clause subset of first-

order logic for which SLD resolution is adequate is limited in the naturalness of its expressiveness, and the most notable omission is that negative information cannot be expressed. (jhd)

DESCRIPTORS: (U) \*ALGORITHMS, COMPUTER PROGRAMMING, LOGIC, RESOLUTION.

IDENTIFIERS: (U) PES1102F, WUAFOSR2304A7.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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OPTICAL SOCIETY OF AMERICA WASHINGTON D C

(U) Summaries of Papers Presented at the Semiconductor Lasers Topical Meeting Held in Albuquerque, New Mexico on February 10-11, 1987.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Oct 87.

OCT 87 192P

PERSONAL AUTHORS: Quinn, Jarus W.

CONTRACT NO. AFOSR-87-0084

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-88-0808

UNCLASSIFIED REPORT

ABSTRACT: (U) Semiconductor diode lasers remain the subject of intensive worldwide development efforts with rapid progress being made in many areas of device design and performance. In addition to their use in optical fiber systems, other applications have been meeting treated all aspects of laser design, development and characterization. Laser and optical techniques are increasingly important for diagnostics of a wide variety of materials and processing technologies. Applications range from diagnostics of impurities and other defects in materials, to probes of dry-processing technologies for semiconductor device fabrication, to imaging techniques for patterning and analysis in VLSI manufacture. These techniques are being used both for analytic measurements and as tools to probe new materials and effects. This meeting brought together workers from all of these areas for the exchange of results and of new directions for research. Optical materials are being applied in ever more stressing environmental conditions. The response and durability of optical materials and coatings under the challenges posed by these environments can determine the overall success of many large-scale programs and of whole classes of optical devices. The purpose of this meeting is to bring together researchers with experience in all aspects (materials, design, fabrication, testing and

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## DTIC REPORT BIBLIOGRAPHY

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## FLORIDA UNIV GAINESVILLE QUANTUM THEORY PROJECT

(U) Convergence of the Coupled-Cluster Singles, Doubles and Triples Method.

APR 88 8P

PERSONAL AUTHORS: Trucks, Gary W.; Noga, Jozef; Bartlett, Rodney J.

CONTRACT NO. AFOSR-88-0041

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR  
TR-88-0595

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v145 n6 p548-554, 22 Apr 88.

ABSTRACT: (U) The convergence of coupled-cluster equations for several cases, CCD, CCSD, CCSDT-n and the full CCSDT is investigated. Comparisons are made between the reduced linear equation (RLE) method for accelerating convergence and simple geometric extrapolation techniques, and between energy and wavefunction convergence criteria. Keywords: Quantum theory, Reprints. (WJM)

DESCRIPTORS: (U) \*CONVERGENCE, EXTRAPOLATION, GEOMETRY, LINEAR ALGEBRAIC EQUATIONS, QUANTUM THEORY, REDUCTION, REPRINTS, WAVE FUNCTIONS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2301A4.

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## VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT OF MATHEMATICS

(U) On Robustness of Controllability for Finite Dimensional Approximations of Distributed Parameter Systems.

DESCRIPTIVE NOTE: Rept. for Sep 88-May 87.

OCT 87 8P

PERSONAL AUTHORS: Burns, John A.; Peitch, Gunther H.

CONTRACT NO. AFOSR-88-0085

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0594

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of the INACS/IFAC International Symposium on Modeling and Simulation of Distributed Parameter Systems, p431-436, 6-9 Oct 87.

ABSTRACT: (U) The nature in which controllability properties of an infinite dimensional distributed parameter system are inherited by various standard finite dimensional approximation schemes is investigated. This question arises when using numerical approximation schemes such as finite element, Galerkin, or finite difference schemes to approximate the original infinite dimensional model. A measure of robustness of controllability for the finite dimensional approximation scheme is given. An example in terms of the heat equation with distributed control illustrates the main ideas and difficulties. (KR)

DESCRIPTORS: (U) \*APPROXIMATION(MATHEMATICS), \*MATHEMATICAL MODELS, \*PARAMETERS, CONTROL, DISTRIBUTION, FINITE DIFFERENCE THEORY, FINITE ELEMENT ANALYSIS, HEAT, SIZES(DIMENSIONS).

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1.

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OPTICAL SOCIETY OF AMERICA WASHINGTON D C

PROCESSING, SEMICONDUCTOR DEVICES, SEMICONDUCTOR DIODES,  
SEMICONDUCTOR LASERS.

(U) Topical Meeting on Lasers in Material Diagnostics Held  
in Albuquerque, New Mexico on 11-12 February 1987.  
Technical Digest Series, Volume 7.

IDENTIFIERS: (U) WUAFOSR2301A1, PE81102F.

DESCRIPTIVE NOTE: Final rept. 1 Jan-31 Oct 87,

OCT 87 141P

PERSONAL AUTHORS: Quinn, Jarus W.

CONTRACT NO. AFOSR-87-0094

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-88-0598

UNCLASSIFIED REPORT

ABSTRACT: (U) Semiconductor diode lasers remain the subject of intensive worldwide development efforts with rapid progress being made in many areas of device design and performance. In addition to their use in optical fiber systems, other applications have been identified and lasers are being fabricated to meet many different system requirements. This meeting treated all aspects of laser design, development and characterization. Laser and optical techniques are increasingly important for diagnostics of a wide variety of materials and processing technologies. Applications range from diagnostics of impurities and other defects in materials, to probes of dry-processing technologies for semiconductor device fabrication, to imaging techniques for patterning and analysis in VLSI manufacture. These techniques are being used both for analytic measurements and as tools to probe new materials and effects. This meeting brought together workers from all of these areas for the exchange of results and of new directions for research. Keywords: Diagnosis; Lasers; Optics. (mjm)

DESCRIPTORS: (U) \*DIAGNOSIS(GENERAL), \*LASERS,  
\*MEASUREMENT, \*OPTICAL EQUIPMENT, EXCHANGE, FABRICATION,  
FIBER OPTICS, GLOBAL, IMAGES, IMPURITIES, MATERIALS,  
METHODOLOGY, OPTICS, ORIENTATION(DIRECTION), PROBES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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MASSACHUSETTS INST OF TECH CAMBRIDGE LAB FOR INFORMATION  
AND DECISION SYSTEMS IDENTIFIERS: (U) PE81102F, WJAFOSR2304A1.

(U) Communication Aspects of Parallel Processing.

DEC 88 51P

PERSONAL AUTHORS: Oezveren, Quesneyt

REPORT NO. LIDS-P-1721

CONTRACT NO. AFOSR-88-0032

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0618

UNCLASSIFIED REPORT

ABSTRACT: (U) Parallel processing was motivated by the need to solve very large computational problems, such as the numerical solutions of partial differential equations in the context of computational fluid dynamics, structural mechanics, image processing, etc. This report surveys recent literature on parallel processing algorithms for mainly rings, meshes, and hypercubes. These algorithms include vector, matrix computations, fixed point iterations and linear equation solvers. A group property of above topologies has also been explored in an attempt to develop tools for algorithms and performance analysis. Some special sparsity structure of the iteration dependencies has also been examined. A necessary and sufficient condition for the reducibility of a dependency matrix with sparse, nonzero extended diagonals has been derived. Keywords: Communications traffic, Traffic distributions. (kr)

DESCRIPTORS: (U) \*COMMUNICATIONS TRAFFIC, \*PARALLEL PROCESSING, ALGORITHMS, COMPUTATIONS, DISTRIBUTION, FLUID DYNAMICS, IMAGE PROCESSING, ITERATIONS, LINEAR ALGEBRAIC EQUATIONS, NUMERICAL ANALYSIS, PARTIAL DIFFERENTIAL EQUATIONS, PERFORMANCE TESTS, REPORTS, RINGS, SOLUTIONS(GENERAL), STRUCTURAL MECHANICS, SURVEYS, TOPOLOGY, TRAFFIC.

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MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

HONEYWELL INC BLOOMINGTON MN SENSORS AND SIGNAL PROCESSING LAB

(U) Study of Infrared Nonlinear Processes in Semiconductors.

(U) Optical Symbolic Processor for Expert System Execution.

DESCRIPTIVE NOTE: Final technical rept. 1 Oct 85-30 Sep 87.

DESCRIPTIVE NOTE: Quarterly technical rept. 1 Dec 87-28 Feb 88.

MAY 88

17P

FEB 88

30P

PERSONAL AUTHORS: Wolff, Peter A.

PERSONAL AUTHORS: Guha, Aloke

CONTRACT NO. AFOSR-85-0269

CONTRACT NO. F49620-86-C-0082

PROJECT NO. 2308

PROJECT NO. 5794

TASK NO. B1

TASK NO. 01

MONITOR: AFOSR

MONITOR: AFOSR

TR-88-0598

TR-88-0818

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This program includes: 1.) Demonstration that phase transitions and electrical instabilities enhance optical nonlinearities in semiconductors. 2.) Discovery of exceedingly large third order optical nonlinearities CUBED CHI . 0.001 ESU with picosecond response time in zero gap materials (HgTe, HgCdTe, HgMnTe). 3.) First observation of impurity-induced optical nonlinearity in semiconductors. 4.) Prediction and observation of negative absolute carrier mobilities in quantum wells. (RH)

DESCRIPTORS: (U) \*CARRIER MOBILITY, \*NONLINEAR SYSTEMS, \*SEMICONDUCTORS, IMPURITIES, INFRARED RADIATION, OBSERVATION, OPTICAL PROPERTIES, PHASE TRANSFORMATIONS, QUANTUM ELECTRONICS, REACTION TIME.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2305B1.

ABSTRACT: (U) The goal of this program is to develop a concept for an optical computer for symbolic computing by defining a computational model of a high level language, examining the possible devices for the ultimate construction of a processor, and by defining the required optical operations. The efforts in this quarter were in the design and analysis of electronic shuffle-exchange networks (SENS), the identification of the bottlenecks in the performance of the network, and the subsequent determination of the guidelines for implementing an optical SEN such that optics can address the electronic limitations and provide the capability of designing a high-performance network. The analysis of electronic SENS required designing the interface between the processors and the SEN, the smart exchange within the board. We considered both gallium arsenide and ECL technologies to determine the highest performance of an electronic SEN. Keywords: Electrooptics. (kr)

DESCRIPTORS: (U) \*OPTICAL PROCESSING, \*NETWORK ANALYSIS(MANAGEMENT), COMPUTATIONS, COMPUTERS, ELECTRONICS, ELECTROOPTICS, GALLIUM ARSENIDES, HIGH LEVEL LANGUAGES, LIMITATIONS, MATHEMATICAL MODELS, NETWORKS, OPTICAL EQUIPMENT, OPTICAL PROPERTIES, OPTICS, SYMBOLS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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IDENTIFIERS: (U) PEG1102F, WJAFOSR578401, SENS(Shuffle Exchange Network), Expert systems.

MINNESOTA UNIV MINNEAPOLIS DEPT OF PSYCHOLOGY

(U) Ability/Motivation Interactions in Complex Skill Acquisition.

DESCRIPTIVE NOTE: Final rept. 1 May 87-28 Feb 88,

APR 88 74P

PERSONAL AUTHORS: Kanfer, Ruth; Ackerman, Phillip L.

CONTRACT NO. AFOSR-87-0234

PROJECT NO. 2313

TASK NO. A7

MONITOR: AFOSR  
TR-88-0884

UNCLASSIFIED REPORT

ABSTRACT: (U) Two central constructs of applied psychology, those of motivation and cognitive ability, are integrated within an information processing perspective. We begin with a conceptual framework for simultaneous consideration of individual differences in cognitive abilities and volitional/self-regulatory processes of motivation. From this framework, we propose that motivational interventions specifically interact with abilities and task demands. Empirical demonstration of the framework is provided in the context of skill acquisition, where the information processing and ability demands change as a function of practice, training paradigm, and the timing of goal setting. Three skill acquisition/goal setting experiments are reported. In a large scale field-based lab setting (1,010 U.S. Air Force trainees). Subjects engaged in complex, computerized, Air Traffic Controller tasks. In the first experiment, the basic learning and ability/performance parameters of the task were evaluated in conjunction with a goal-setting intervention early in practice. Results offered support for the initial tenets of the framework, and point to a number of critical issues in the appropriate use of goal-setting in a complex learning environment. In Experiment 2, goal setting was further investigated at a later stage of skill acquisition, for demonstration of the interactions between task demands and motivational

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OTIC REPORT BIBLIOGRAPHY

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interventions. The third experiment simultaneously examined the effects of task training content, goal setting, and ability/performance interactions during skill acquisition. Keywords: Air Force training. (sch)

DESCRIPTORS: (U) \*MOTIVATION, \*AIR FORCE TRAINING, SKILLS, COGNITION, INFORMATION PROCESSING, ACQUISITION, COMPUTERIZED SIMULATION, AIR TRAFFIC CONTROL SYSTEMS, PERFORMANCE(HUMAN), LEARNING.

IDENTIFIERS: (U) Individual differences, Goal setting.

FLORIDA UNIV GAINESVILLE DEPT OF CHEMISTRY

(U) Laser Excited Ionic Fluorescence Spectrometry of Rare Earth Elements in the Inductively Coupled Plasma.

87

PERSONAL AUTHORS: Tremblay, W. D.; Smith, B. W.; Winefordner, J. D.

CONTRACT NO. AFOSR-86-0018

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-88-0555

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Analytica Chimica Acta, v189 p111-118 1987.

ABSTRACT: (U) A pulsed tunable dye laser pumped with an excimer laser is used to excite ionic fluorescence of the rare earth elements in the inductively-coupled plasma. Because several fluorescence lines were observed after laser excitation, it was possible to draw partial energy-level diagrams for most of the rare earths. Non-resonance fluorescence lines were used for all measurements in order to minimize spectral interferences. Detection limits at given excitation wavelengths are reported for each element. Laser-excited ionic fluorescence eliminates the problem of spectral interferences which has been associated with the determination of the rare earths by atomic emission spectrometry in the inductively-coupled plasma. Reprints. (mjm)

DESCRIPTORS: (U) \*COUPLING(INTERACTION), \*EXCITATION, \*PLASMAS(PHYSICS), \*RARE EARTH COMPOUNDS, \*DYE LASERS, ATOMIC SPECTRA, DETECTION, EMISSION SPECTRA, EXCIMERS, FREQUENCY, LIMITATIONS, MEASUREMENT, RARE EARTH ELEMENTS, REPRINTS, SPECTROMETRY.

IDENTIFIERS: (U) WUAFOSR2303A1, PE81102F, Inductively Coupled Plasma.

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DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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CALIFORNIA UNIV LOS ANGELES SCHOOL OF ENGINEERING AND  
APPLIED SCIENCE

(U) Strong and Weak Stabilizability: Lyapunov Type  
Approaches.

DESCRIPTIVE NOTE: Doctoral thesis,

APR 88 80P

PERSONAL AUTHORS: Miyaji, Wendell M.

CONTRACT NO. AFOSR-86-0132

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0817

UNCLASSIFIED REPORT

ABSTRACT: (U) This theses addresses the problem of determining stabilizing controls for distributed parameter systems. The focus is on controls which provide strong or weak stabilization to the system. One approach to the stabilization of finite dimensional systems and exponential stabilization of infinite dimensional systems has been the use of Lyapunov type functionals. This is one technique which is developed and extended here, to provide new conditions for strong or weak stability. A new functional is presented, and if this functional is strictly positive, a certain semigroup will be strongly stable. This functional suggests an inequality relation which, if satisfied guarantees the weak stability of uniformly bounded semigroups. The relationship between contraction semigroups is examined on a Hilbert space and shift semigroups on a related Hilbert space. In particular, strongly stable semigroups are found to be equivalent in a certain sense to a backward shift semigroup. This provides an alternative view point for strong stability. Since stable semigroups are uniformly bounded and since this condition is important in verifying stability we examine this phenomena. Some new observations are presented to illustrate conditions under which perturbations of uniformly bounded semigroups remain uniformly bounded. (jhc)

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UNCLASSIFIED

PAGE 2<sup>A</sup>

EVI46A

DESCRIPTORS: (U) \*LYAPUNOV FUNCTIONS, \*CONTROL THEORY,  
CONTROL, DISTRIBUTION, HILBERT SPACE, LOW STRENGTH,  
PARAMETERS, PERTURBATIONS, SIZES(DIMENSIONS), STABILITY,  
STABILIZATION, THESES, GROUPS(MATHEMATICS).

IDENTIFIERS: (U) WJAFOSR2304A1, PE81102F.

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A196 388 7/3 7/2

AD-A196 354 11/6.1 20/3

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

MASSACHUSETTS INST OF TECH CAMBRIDGE CENTER FOR  
MATERIALS SCIENCE AND ENGINEER RING(U) Oxidation of Disilenes with Atmospheric Oxygen: A  
Status Report.

88 14P

PERSONAL AUTHORS: West, Robert; Yokelson, Howard B.;  
Gillette, Gregory R.; Millevolte, Anthony J.

CONTRACT NO. F48620-86-C-0010

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-88-0621

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Silicon Chemistry, ch28 p289-  
281 1988.ABSTRACT: (U) Current knowledge and understanding of the  
oxygen oxidation of disilenes will be summarized. The  
various oxidation products, many of which have unusual  
structures will be described, and possible models for  
chemical bonding in these novel compounds will be  
considered. Finally, mention will be made of the many  
unsolved problems in this surprisingly complex area of  
disilene chemistry. Keywords: Cyclic compounds, Siloxanes,  
Reprints. (AW)DESCRIPTORS: (U) \*CYCLIC COMPOUNDS, \*OXIDATION, \*SILICON  
COMPOUNDS, CHEMICAL BONDS, OXYGEN, REPRINTS, SILOXANES.

IDENTIFIERS: (U) \*Disilenes.

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(U) Synthetic Metals from Intercalated Graphite.

DESCRIPTIVE NOTE: Final rept. 10 Oct 84-30 Sep 87.

MAY 88 32P

PERSONAL AUTHORS: Dresselhaus, M. S.; Dresselhaus, G.

CONTRACT NO. F48620-83-C-0011

PROJECT NO. 2306

TASK NO. C3

MONITOR: AFOSR  
TR-88-0644

UNCLASSIFIED REPORT

ABSTRACT: (U) A summary is presented of research carried  
out over the three year period October 1, 1984 -  
September 30, 1987 on the program 'Synthetic Metals from  
Intercalated Graphite'. The research covers Synthesis and  
Compositional Characterization of Graphite Intercalation  
Compounds, Structural Studies, Lattice Mode Studies,  
Electronic Structure, Transport Properties, Magnetic  
Studies in Graphite Intercalation Compounds,  
Superconductivity Studies in Graphite Intercalation  
Compounds, and Review Articles and Plenary Invited Talks.  
Keywords: Graphite intercalation compounds, Magnetic  
properties, Superconductivity properties. (JES)DESCRIPTORS: (U) \*GRAPHITE, \*MAGNETIC FIELDS, \*MAGNETIC  
PROPERTIES, \*METALS, ELECTRONICS, LAYERS, STRUCTURAL  
PROPERTIES, SUPERCONDUCTIVITY, SYNTHESIS, TRANSPORT  
PROPERTIES, PHASE SHIFT, ELECTRIC CONDUCTORS, MAGNETIC  
MATERIALS.

IDENTIFIERS: (U) Synthetic metals, Graphite intercalation.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A196 321 6/11

AD-A196 321 CONTINUED

ROCHESTER UNIV MEDICAL CENTER NY DEPT OF PHARMACOLOGY

DEGRADATION, ENZYMES, HALOGENATION, HIGH RATE, ISOLATION, MICROSONES, MITOCHONDRIA, RATS, SOURCES, SUBSTRATES, TRANSFERASES.

(U) Biosynthesis, Physiological Disposition, and Biochemical Effects of Nephrotoxic Glutathione and Cysteine S-Conjugates.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2312A5.

DESCRIPTIVE NOTE: Annual technical rept. 15 Aug 88-23 Jul 87.

SEP 87

PERSONAL AUTHORS: Anders, W. W.

CONTRACT NO. AFOSR-86-0303

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR YR-88-0192

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The nephrotoxicity of certain halogenated alkanes and alkenes is the result of hepatic glutathione S-conjugate formation, followed by renal metabolism of the conjugates to corresponding cysteine S-conjugates, which then undergo renal bioactivation to the ultimate toxic species. These experiments have used synthetic PCBG as the substrate and hepatic microsomal fractions as the source of enzyme. Results indicate that PCBG is a substrate for microsomal transferases; with the reaction being time-dependent, protein-dependent, PCBG-dependent and dependent upon glutathione concentrations. Methods to study the alkylation of renal DNA have been devised with sulfides X-V being isolated to allow generation of putative reaction intermediates in high yield. Predictions can be made that the sulfide will be cytotoxic to isolated rat hepatocytes. PCBG inhibits renal mitochondrial DNA synthesis and the effect is concentration dependent and inhibited by aminooxyacetic acid. The effect of DNA degradation is being investigated. (AW)

**DESCRIPTORS:** (U) \*BIOSYNTHESIS, \*DEOXYRIBONUCLEIC ACIDS, \*KIDNEYS, \*LIVER, \*METABOLISM, \*TOXICITY, \*ALKENES, ALKANES, ALKYLATION, BIOCHEMISTRY, CELLS(BIOLOGY).

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AD-A196 247 20/4

AD-A196 246 12/8

RENSELAER POLYTECHNIC INST TROY NY

MARYLAND UNIV COLLEGE PARK DEPT OF COMPUTER SCIENCE

(U) Theoretical Aerodynamics, Transonic Flow.

(U) Parallel Matrix Computations.

DESCRIPTIVE NOTE: Final rept. 1 Jul 82-31 Oct 87.

DESCRIPTIVE NOTE: Final rept. 1982-1987.

FEB 88

MAR 88

PERSONAL AUTHORS: Cole, Julian D.

PERSONAL AUTHORS: Stewart, G. W.; O'Leary, Dianne P.

CONTRACT NO. AFOSR-82-0155

CONTRACT NO. AFOSR-82-0078

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A4

TASK NO. A3

MONITOR: AFOSR  
TR-88-0656

MONITOR: AFOSR  
TR-86-0655

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) A substantial body of work on transonic aerodynamics and problems using related applied mathematical techniques was carried out on this AFOSR grant. A listing of the main publications produced with the support of this grant is given. (edc)

ABSTRACT: (U) This project concerns the design and analysis of algorithms to be run in a processor-rich environment. We focus primarily on algorithms that require no global control and that can be run on systems with only local connections among processors. We investigate the properties of these algorithms both theoretically and experimentally. The experimental work is done on the ZMOB, a working parallel computer operated by the Laboratory for Parallel Computation of the Computer Science Department at the University of Maryland. To give out work direction, we have focused on two areas: Dense problems from numerical linear algebra; and The iterative and direct solution of sparse linear systems. Keywords: Bibliographies; Abstracts. (kr)

DESCRIPTORS: (U) \*TRANSONIC FLOW, AERODYNAMICS, APPLIED MATHEMATICS, DOCUMENTS, MATHEMATICAL ANALYSIS.

DESCRIPTORS: (U) \*ALGORITHMS, \*PARALLEL PROCESSORS, BIBLIOGRAPHIES, COMPUTATIONS, COMPUTERS, CONTROL, GLOBAL, HIGH DENSITY, ITERATIONS, LINEAR ALGEBRA, LINEAR SYSTEMS, MARYLAND, NUMERICAL ANALYSIS, PARALLEL ORIENTATION, SOLUTIONS(GENERAL).

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A4.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A3.

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AD-A196 246

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A196 165 6/1

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BAYLOR COLL OF MEDICINE HOUSTON TX

(U) Noradrenergic Enhancement of Long-Term Synaptic Potentiation.

\*SYNAPSE, ADENOSINE PHOSPHATES, CALCIUM, CHANNELS, CYCLIC COMPOUNDS, HIPPOCAMPUS, HYPOTHESES, LOW RATE, MODULATION, STIMULATION(GENERAL).

IDENTIFIERS: (U) WJAFOSR2312A2, PE01102F.

88

PERSONAL AUTHORS: Johnston, Daniel; Hopkins, William F.; Gray, Richard

CONTRACT NO. AFOSR-85-0173

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-88-0802

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Biophysics to Behavior, p355-376 1988.

ABSTRACT: (U) We have shown that norepinephrine (NE) enhances the magnitude, duration, and probability of induction of long-term potentiation (LTP) at mossy fiber synapses. The modulatory effect of NE on mossy fiber synaptic transmission appears to be dependent on the frequency of the stimulation, that is, NE exerts little or no effect at low rates of stimulation but enhances transmission following high-frequency trains of stimulation. This frequency- or activity-dependent action of NE stands in contrast to NE's reported effects at other excitatory synapses in the hippocampus. Our experiments support the conclusion that the modulation of LTP by NE is mediated by the activation of beta-adrenoceptors, leading to a stimulation of cyclic AMP in the postsynaptic neuron. We also found that NE, beta-adrenoceptor agonists, and 8-bromo-cyclic AMP enhanced voltage-dependent calcium conductance mechanisms. We present a working hypothesis that the enhancement of LTP by NE is through increased calcium channel activity, leading to greater calcium influx in postsynaptic neuron. Keywords: Nerve transmission; Calcium channels; Hippocampus. (kt)

DESCRIPTORS: (U) \*LEVAMETRENDOL, \*NERVE TRANSMISSION,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV148A

AD-A198 128 20/4 21/2

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FLOW RESEARCH INC KENT WA

(U) Direct Numerical Simulations of an Unpremixed Turbulent Jet Flame.

the flexibility of a finite element code. Scalar transport equations are included for simulations of mixing and chemical reaction in a complex three-dimensional turbulent flow. Keywords: Combustion. (AW)

DESCRIPTIVE NOTE: Annual technical rept. 18 Feb 85-18 Feb 88.

DESCRIPTORS: (U) \*FLAMES. \*TURBULENT FLOW, ACCURACY. CHEMICAL REACTIONS, CODING, COHERENCE, COMBUSTION, EQUATIONS, EXTINCTION, FINITE ELEMENT ANALYSIS, FLOW, HOMOGENEITY, HYPOTHESES, JET FLAMES, LAYERS, MIXING, NUMERICAL ANALYSIS, REACTION KINETICS, SCALAR FUNCTIONS, SHEETS, SIMULATION, STRUCTURES, THREE DIMENSIONAL FLOW, TRANSPORT PROPERTIES, TURBULENCE, TWO DIMENSIONAL, VORTICES.

MAR 88

PERSONAL AUTHORS: Givi, P.; Jou, W.-H.; McMurtry, P. A.; Metcalfe, R. W.

REPORT NO. FLOW-RR-440

CONTRACT NO. F49620-85-C-0087

IDENTIFIERS: (U) WUAFOSR2308A2, PE81102F.

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-88-0848

UNCLASSIFIED REPORT

ABSTRACT: (U) Direct numerical simulations (DNS) have been performed to study the phenomenon of mixing and its effects on chemical reactions in an unpremixed turbulent reactive flow. The type of flows considered were 1) two-dimensional temporally developing mixing layers, 2) two- and three-dimensional spatially evolving mixing layers, and 3) three-dimensional homogeneous turbulent flows. The emphasis of the simulations for the first two types of flows was the local flame extinction caused by the high rate of strain in a chemically nonequilibrium turbulent flow. It was shown that flame extinction occurs in the high strain region of the braids of the coherent structures. Preliminary investigation of the three-dimensional flow shows a highly contorted flame sheet caused by the combination of the two-dimensional coherent structures and the longitudinal (streamwise) vortices. The homogeneous turbulence simulations were performed to test Toor's hypothesis. The results of the simulations suggested a revision to the hypothesis. During the course of the research, a three-dimensional spectral-element code was developed for the three-dimensional flows. The code combined the accuracy of a pseudospectral code with

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TEXAS UNIV AT AUSTIN DEPT OF PHYSICS

NATIONAL ACADEMY OF SCIENCES WASHINGTON DC BOARD ON  
MATHEMATICAL SCIENCES

(U) High-Resolution Electron Energy Loss Spectroscopy.

87

PERSONAL AUTHORS: Erskine, James L.

(U) Report of the Advisory Panel to the Mathematical and  
Information Science Directorate.

DESCRIPTIVE NOTE: Final rept. 1 Sep 85-30 Mar 87.

CONTRACT NO. AFOSR-86-0108

APR 88

PROJECT NO. 2303

PERSONAL AUTHORS: Fleming, Wendell

TASK NO. A2

CONTRACT NO. F49620-C-86-0023

MONITOR: AFOSR  
TR-88-0629

PROJECT NO. 2304

TASK NO. A1

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-88-0801

SUPPLEMENTARY NOTE: Pub. in CRC Critical Reviews in Solid  
State and Materials Sciences, v13 n4 p311-380 1987.

UNCLASSIFIED REPORT

ABSTRACT: (U) High-resolution electron energy loss  
spectroscopy (EELS) has recently emerged as one of the  
most important techniques for probing physical and  
chemical properties of surfaces. Several factors account  
for the rapidly growing popularity of EELS and other  
spectroscopic techniques that probe surface vibrational  
properties. This brief introduction serves to outline  
some of the novel and important features of EELS which  
account for the growing popularity of the technique.  
Reprints. (mjm)

DESCRIPTORS: (U) \*CHEMICAL PROPERTIES, \*PHYSICAL  
PROPERTIES, \*SPECTROSCOPY, \*SURFACE PROPERTIES,  
\*VIBRATION, PROBES, REPRINTS.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2303A2.

ABSTRACT: (U) The Advisory Panel was charged  
specifically with appraising the balance and general  
effectiveness of the programs of the Mathematical and  
Information Sciences Directorate and preparing  
recommendations and suggestions in response to questions  
such as the following: 1) Do research plans address  
critical technical issues within the scope of the mission  
of the Directorate? 2) Is the planning adequate for the  
near term and for the long term? 3) Is the work  
appropriate and effective in reaching the objectives of  
the program? and 4) Is the research work itself at the  
state of the art? What is the quality of the  
investigators being supported? This report discusses the  
following topics: Impact of the Directorate's Research on  
Air Force Technology Needs; Proposal Review and Selection  
Procedures; Opportunities If More Funds Were Available;  
Dynamics and Control; Communications and Signal  
Processing; Optimization; Probability and Statistics;  
Computational Mathematics; Finite Mathematics; Computer  
Science; Artificial Intelligence; Physical Mathematics  
and Applied Analysis Overview; Relations With Air Force  
Laboratories; Recommendations Concerning Future  
Directions. (KR)

DESCRIPTORS: (U) \*INFORMATION SCIENCES, \*MATHEMATICS.

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AIR FORCE, AIR FORCE FACILITIES, APPLIED MATHEMATICS,  
ARTIFICIAL INTELLIGENCE, COMPUTATIONS, COMPUTERS,  
DYNAMICS, LABORATORIES, MILITARY REQUIREMENTS,  
OPTIMIZATION, PHYSICAL SCIENCES, PLANNING, SELECTION,  
SIGNAL PROCESSING.

IOWA UNIV IOWA CITY DEPT OF MANAGEMENT SCIENCES  
(U) Temporal Knowledge Representation and Reasoning for  
Project Planning.

DESCRIPTIVE NOTE: Final rept. 1 Feb 87-31 Jan 88.

IDENTIFIERS: (U) P681102F, WUAFOSR2304A1.

APR 88

PERSONAL AUTHORS: Bell, Colin E.

CONTRACT NO. AFOSR-87-0118

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-88-0528

UNCLASSIFIED REPORT

ABSTRACT: (U) The author has written a working computer program which allows a user (or a different module of an AI planning program) to specify a set of temporal constraints including disjunctive constraints. In the context of a point-based temporal model, my program has required several innovative design choices. The program will find a feasible solution to the constraints if one exists, otherwise it will identify a contradiction. It is especially appropriate when adding new constraints to currently satisfiable existing constraints. The philosophical approach of dependency-directed backtracking is employed. This is implemented in a way that takes account of my problem's special structure. The program is particularly successful in certain examples for which chronological backtracking would be hopelessly inefficient. Other notorious examples require time-consuming search. These examples reveal important tradeoffs between explicitly storing temporal knowledge and deriving appropriate temporal knowledge on demand. Particular instances have been identified where explicit storage is critical for avoiding expensive search. Keywords: Knowledge based systems. (kr)

DESCRIPTORS: (U) \*COMPUTER PROGRAMS, \*REASONING,  
\*ARTIFICIAL INTELLIGENCE, CONSUMPTION, PLANNING,  
SEARCHING, STORAGE, TIME, TRADE OFF ANALYSIS.

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WAYNE STATE UNIV DETROIT MI DEPT OF PHYSICS AND  
ASTRONOMY

IDENTIFIERS: (U) PEG1102F, WJAFOSR2304A7.

(U) Dissociative Electron Attachment to Rovibrationally  
Excited Molecules.

DESCRIPTIVE NOTE: Annual technical rept. no. 3 (Final) 1  
Sep 84-31 Aug 87,

AUG 87

PERSONAL AUTHORS: Wadenira, J. M.

CONTRACT NO. AFOSR-84-0143

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-88-0548

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary aim of our project has been to investigate the role played by the initial rovibrational excitation of a molecule in enhancing the cross sections and, therefore, the rates of dissociative electron attachment to the molecule. An enhancement of the attachment rate results in the enhancement of the production of negative ion beams. The processes of dissociative electron attachment and of resonant vibrational excitation are complementary processes as the intermediate resonant anion state of the molecule, formed by electron impact, either can autodetach the electron or can dissociate itself. Therefore, as a further part of the present investigations we have explored excitation of the molecule. Our first project was to study the effect of initial vibrational excitation on the rates of production of negative atomic lithium ions via the process of dissociative electron attachment of lithium dimers. Keywords: Rovibrationally, oscillators, Resonant. (mjm)

DESCRIPTORS: (U) \*DIMERS, \*ELECTRONS, \*ION BEAMS,  
\*LITHIUM, ANIONS, ATTACHMENT, CROSS SECTIONS,  
DISSOCIATION, ELECTRON IMPACT SPECTRA, EXCITATION,  
MOLECULES, OSCILLATORS, PRODUCTION, RATES, RESONANCE.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV148A

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VIBRATION.

TENNESSEE UNIV KNOXVILLE DEPT OF ELECTRICAL ENGINEERING

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A7.

(U) Millimeter Microwave Emission by Use of Plasma  
Produced Electrons Orbiting a Positively-Charged Wire.

DESCRIPTIVE NOTE: Final scientific rept. 15 Nov 82-15 Mar  
86.

MAR 86

PERSONAL AUTHORS: Alexeff, Igor

CONTRACT NO. AFOSR-82-0045

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR  
TR-87-0432

UNCLASSIFIED REPORT

ABSTRACT: (U) Significant progress was recorded on the exploration of the physics of the Orbitron microwave source. Early, in the work, continuous emission was observed in the range up to 26 GHz. A numerical code was developed for computing collective electron oscillations. Later, repeatable pulsed operation was observed up to 430 GHz at 0.2 watts in a two microsecond pulse. Spurious emissions up to 1000 GHz have also been observed. Keywords include: Plasma, Orbitron, and Microwaves. (RH)

DESCRIPTORS: (U) \*MICROWAVES, \*MILLIMETER WAVES, CODING, ELECTRONS, EMISSION, MICROSECOND TIME, NUMERICAL ANALYSIS, OPERATION, ORBITS, OSCILLATION, PHYSICS, PULSES, REPRODUCIBILITY, SOURCES, SPURIOUS EFFECTS.

IDENTIFIERS: (U) PE61102F, WUAFOSR2301A8.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

TRANSFER.

(U) Chemisorption of Fluorocarbon Free Radicals on Silicon and SiO<sub>2</sub>.

IDENTIFIERS: (U) WJAFOSR2303B1, PE61102F.

FEB 88

PERSONAL AUTHORS: Joyce, S.; Langan, J.; Steinfeld, J. I.

CONTRACT NO. F49620-88-C-0003

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-88-0568

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v88  
n3 p2027-2032, 1 Feb 88.

ABSTRACT: (U) We have investigated the interaction of CF<sub>3</sub> free radicals, produced by infrared multiple-photon dissociation of C<sub>2</sub>F<sub>6</sub>, with Si(100) and SiO<sub>2</sub> surfaces. The CF<sub>3</sub> radicals initially undergo dissociative chemisorption on the Si surface to produce surface carbides and fluorosilyl species. At higher coverages, the fluorine transfer reaction is inhibited. Significantly smaller amounts of the CF<sub>3</sub> radical chemisorb on the oxide surfaces, and those that do adsorb do not dissociate. Sputtering the oxide surface by argon ion bombardment increases the amount of radicals that can be adsorbed. Ion bombardment of the fluorocarbon overlayer on both surfaces results primarily in removal of the CF<sub>3</sub> groups. The radical reactions cannot by themselves account for SiO<sub>2</sub>/Si selectivity in plasma reactive etching, but do appear to play an important role in anisotropic etching. Keywords: Silicon, Silicon oxide, Chemical etching, Surface chemistry. (mjm)

DESCRIPTORS: (U) \*CHEMISORPTION, \*FLUORINATED HYDROCARBONS, \*SILICON, \*SILICON DIOXIDE, ANISOTROPY, ARGON, CARBIDES, CHEMICALS, DISSOCIATION, ETCHING, FLUORINE, FREE RADICALS, ION BOMBARDMENT, OXIDES, PLASMAS(PHYSICS), REACTIVITIES, RESPONSE, SILICON COMPOUNDS, SPUTTERING, SURFACE CHEMISTRY, SURFACES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 980 CONTINUED

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BOSTON UNIV MA

(U) On the Utilization of Ionosonde Data to Analyze the  
Latitudinal Penetration of Ionospheric Storm Effects,

MAR 88

PERSONAL AUTHORS: Forbes, Jeffrey M.; Codrescu, Mihail;  
Hall, Timothy J.

CONTRACT NO. AFOSR-85-0048

PROJECT NO. 2310

TASK NO. A2

MONITOR: AFOSR  
TR-88-0558

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Geophysical Research Letters,  
V15 n3 p249-252 Mar 88. Original contains color plates:  
All DTIC and NTIS reproductions will be in black and  
white.

ABSTRACT: (U) Increased emphasis is placed on global  
coupling between the magnetosphere, ionosphere, and  
thermosphere systems, particularly with regard to the  
penetration of dynamic, chemical, and electrodynamic  
effects from high to low latitudes during magnetically  
disturbed periods. An emerging potential exists for  
latitudinal and longitudinal chains of ionosondes to  
contribute uniquely to this thrust in ways complementary  
to the capabilities and shortcomings of other groundbased  
sensors and satellites. Here is illustrated a methodology  
to realize the fullest potential of such ionosonde data.  
Hourly values are fit in latitude using Legendre  
polynomials, and variations from quiet time values are  
displayed in latitude - U.T. coordinates using a color  
graphics method which provides an illuminating  
illustration of the penetration of ionospheric  
disturbances in latitude and their dependence on Kp,  
storm time, and local time. Observed effects are  
interpreted in terms of plausible electric field, neutral  
wind, and neutral composition changes during the storm  
period. Besides reflecting the anticipated southward  
flows and equatorward extensions in conjunction with

magnetically disturbed conditions, the 24-hour average  
meridional winds exhibit a northward return flow after  
the magnetic disturbance has relaxed. Reprints. (JHD)

IDENTIFIERS: (U) WJAFOSR2310A2, PE81102F.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 979 7/3

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Dissociation Dynamics of Low-Lying Electronic States of SiH<sub>2</sub>.

FEB 88 9P

PERSONAL AUTHORS: Francisco, J. S.; Barnes, R.; Thoman, J. W., Jr

CONTRACT NO. F49620-88-C-0003

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-88-0553

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v88  
n4 p2334-2341, 15 Feb 88.ABSTRACT: (U) Essential features of the potential surfaces for low-lying electronic states of silylene, SiH<sub>2</sub>, have been characterized. Calculated transition energies between the X1A<sub>1</sub>, a3B<sub>1</sub>, and A1B<sub>1</sub> states are in agreement with previously published experimental and theoretical values. (Reprints, silanes). (MUM)

DESCRIPTORS: (U) \*SILANES, DISSOCIATION, DYNAMICS, ELECTRONIC STATES, ENERGY, LOW LEVEL, REPRINTS, SURFACES, TRANSITIONS, VALUE.

IDENTIFIERS: (U) WJAFOSR2303B1, PE61102F.

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JOHNS HOPKINS UNIV LAUREL MD APPLIED PHYSICS LAB

(U) Investigations of Magnetosphere-Ionosphere Coupling Relevant to Operational Systems.

DESCRIPTIVE NOTE: Final scientific rept. 1984-1987.

FEB 88

PERSONAL AUTHORS: Meng, C. I.; Newell, P. T.

CONTRACT NO. AFOSR-84-0049

PROJECT NO. 2311

TASK NO. A1

MONITOR: AFOSR  
TR-88-0622

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) Important advances were made in understanding the dynamics of the magnetosphere and its coupling to the ionosphere. Significant progress was made in the areas of polar cusp precipitation and dynamics; dayside auroral morphology and auroral boundary dynamics; polar rain; the quiescent polar cap; the physics of impulsive injection phenomena; and problems of global magnetospheric plasma transport. Keywords: Auroral oval, Magnetosheaths, Polar cap absorption, Defense meteorological satellite program, Magnetosphere, Ionosphere, Aurora, Cusp, Storm, Particle precipitation, Magnetic storms. (JHD)

DESCRIPTORS: (U) \*ATMOSPHERIC PHYSICS, .

IDENTIFIERS: (U) PE61102F, WJAFOSR2311A1.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI46A

AD-A195 971 20/9

AD-A195 970 20/4

R AND D ASSOCIATES ALEXANDRIA VA WASHINGTON RESEARCH LAB

STANFORD UNIV CA APPLIED MATHEMATICS GROUP

(U) Unified Study of Plasma/Surface Interactions for Space Power and Propulsion.

(U) Mathematical Problems of Nonlinear Wave Propagation and of Waves in Heterogeneous Media.

DESCRIPTIVE NOTE: Final rept. 15 JUL 87-29 Feb 88.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 87,

FEB 88

MAR 88

CONTRACT NO. F49620-86-C-0089

PERSONAL AUTHORS: Keller, Joseph B.

PROJECT NO. 2308

CONTRACT NO. AFOSR-85-0007

TASK NO. A1

PROJECT NO. 2304

MONITOR: AFOSR  
TR-88-0800

TASK NO. A4

MONITOR: AFOSR  
TR-88-0852

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) High specific impulse, high specific power devices, such as magnetoplasma dynamic arcjets, laser or microwave propulsion channels, and MHD generators, involve the flow of modest temperature (0.5 - 5 eV) partially ionized gases at speeds of 5 - 20 km/sec. The interactions of such flows with solid surfaces containing channeling or penetrating the flow provide a principal source of concern for the efficiency and lifetime of high specific power systems. The present report describes a basic research effort that examines the plasma/surface interaction experimentally in an arrangement providing diagnostic access usually unavailable in mission-oriented, device-development projects. (MUM)

**DESCRIPTORS:** (U) \*MAGNETOHYDRODYNAMIC GENERATORS, \*PLASMAS(PHYSICS), \*PROPULSION SYSTEMS, \*SPACE SYSTEMS, ACCESS, CHANNELS, DIAGNOSIS(GENERAL), HIGH POWER, INTERACTIONS, IONIZED GASES, LASERS, MICROWAVES, POWER, SOLID BODIES, SPECIFIC IMPULSE SURFACES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2308A1.

**ABSTRACT:** (U) The asymptotic behavior of weakly nonlinear waves at caustics is determined for nonlinear wave propagation. A theory is developed for the propagation of short waves of any strength. A method is found for analyzing the stability of a large class of nonlinear waves. The theory of acoustoelasticity is reduced by considering nonlinear effects on waves in granular material. The theory of waves in heterogeneous media analyzed scattering by slender bodies. The pass and stop bands are determined for waves in stratified periodic media. The same is done for an acoustic medium containing rigid spheres arranged in a simple cubic lattice. The amplitude equations are determined for resonantly-interacting water waves in water of nonuniform depth. Keywords: Nonlinear waves; Heterogeneous media; Reciprocal theorems; Effective parameters; Pouring flows; Surface flow; Weir flow; Caustics of nonlinear waves; Asymptotic behavior of stability regions for Hill's equation; Stability of periodic plane waves; Lower bounds of permeability; Newtons second law; Stability of plane wave solutions of nonlinear systems; Resonantly interacting water waves; Nonlinear hyperbolic waves. (jnd)

**DESCRIPTORS:** (U) \*CAUSTICS, \*ACOUSTIC WAVES, \*UNDERWATER ACOUSTICS, ACOUSTICS, AMPLITUDE, ASYMPTOTIC SERIES, DEPTH, EQUATIONS, FLOW, GRANULES, HETEROGENEITY, HIGH FREQUENCY,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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HYPERBOLAS, INTERACTIONS, MATHEMATICS, MEDIA, NONLINEAR ALGEBRAIC EQUATIONS, NONLINEAR PROPAGATION ANALYSIS, NONLINEAR SYSTEMS, NONUNIFORM, PERMEABILITY, PLANE WAVES, REGIONS, RIGIDITY, SCATTERING, SIMPLE CUBIC LATTICES, SLENDER BODIES, SOLUTIONS(GENERAL), SPHERES, STABILITY, STRATIFICATION, SURFACES, THEOREMS, THEORY, WATER, WATER WAVES, WAVE PROPAGATION, WAVES.

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY  
(U) Symposium on Electroactive Polymers, ACS National Meeting (193rd).

DESCRIPTIVE NOTE: Final rept.,  
88 13P

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A4.

PERSONAL AUTHORS: Paras, De.; Prasad, N.

CONTRACT NO. AFOSR-87-0156

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-88-0487

UNCLASSIFIED REPORT

ABSTRACT: (U) This international symposium focused on the nonlinear optical properties of organic molecules and conjugated polymers, an exciting area of research clearly at the fore front because of the tremendous interest in optical signal processing and optical computing. This multidisciplinary symposium had participation from theoretical, physical and synthetic chemists, physicists and device engineers. It provided a forum for people from different backgrounds to interface their findings, to review the status of this area from microscopic understanding at one end, to device fabrication at the other end, and to formulate future directions. (NUM)

DESCRIPTORS: (U) \*ELECTROCATALYSTS, \*OPTICAL PROCESSING, \*OPTICAL PROPERTIES, \*POLYMERS, CHEMISTS, COMPUTATIONS, INTERNATIONAL, MOLECULES, NONLINEAR SYSTEMS, ORGANIC COMPOUNDS, PHYSICISTS, SIGNAL PROCESSING, SYMPOSIA.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2303A3

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

AD-A195 898 20/12

CALIFORNIA UNIV LOS ANGELES DEPT OF ELECTRICAL  
ENGINEERING

(U) Light-Millimeter Wave Interactions in Semiconductor  
Devices.

DESCRIPTIVE NOTE: Semi-annual rept. 1 Jan-31 Dec 87.

DEC 87

PERSONAL AUTHORS: Fetterman,

CONTRACT NO. F49620-88-K-0007

PROJECT NO. 2305

TASK NO. B2

MONITOR: AFOSR  
TR-88-0528

UNCLASSIFIED REPORT

ABSTRACT: (U) Techniques of Optical Control of  
millimeter wave devices have been explored using both  
mixing techniques and short pico-second optical pulses.  
The devices under test include the fastest GaAlAs HEMT  
structures as well as new high frequency bipolar  
heterojunction devices. (RH)

DESCRIPTORS: (U) \*MILLIMETER WAVES, \*SEMICONDUCTOR  
DEVICES, CONTROL, LIGHT PULSES, MIXING, OPTICAL  
PROPERTIES, SHORT PULSES.

IDENTIFIERS: (U) WJAFOSR230582, PE61102F.

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AD-A195 887 12/8

ILLINOIS UNIV AT URBANA DEPT OF STATISTICS

(U) Instrumentation for Computational Statistical Research.

DESCRIPTIVE NOTE: Final rept. 15 Jul-15 Nov 87,

NOV 87 4P

PERSONAL AUTHORS: Sacks, Jerome

CONTRACT NO. AFOSR-87-0041

PROJECT NO. 2304, 2917

TASK NO. A5

MONITOR: AFOSR  
TR-88-0857

UNCLASSIFIED REPORT

ABSTRACT: (U) This is the final report of a grant issued  
under the University Research Instrumentation Program.  
Computing equipment was purchased to establish a network  
of 14 Sun work-stations. This network made a variety of  
research efforts in the area of design and analysis of  
computational experiments. This report details purchases  
and related publications. Keywords: Probability density  
function estimation; Monte Carlo method; Statistical  
tests; Bibliographies. (KR)

DESCRIPTORS: (U) \*COMPUTERS, COMPUTATIONS, ESTIMATES,  
MONTE CARLO METHOD, PROBABILITY DENSITY FUNCTIONS,  
STATISTICAL TESTS, STATISTICS, ACQUISITION.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A5.

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DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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AD-A195 886 14/2 9/3 20/11

STATE UNIV OF NEW YORK AT ALBANY RESEARCH FOUNDATION

(U) Laser Sensing for Identification and Control of Distributed Parameter Systems.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 87.

MAY 88

PERSONAL AUTHORS: Yman, Daniel J.

CONTRACT NO. AFOSR-87-0089

PROJECT NO. 2917

TASK NO. A5

MONITOR: AFOSR  
TR-88-0854

UNCLASSIFIED REPORT

ABSTRACT: (U) This instrumentation award funded the purchase of a laser vibrometer system, mass computer data storage and data acquisition equipment. This equipment used in conjunction with existing vibration testing and control facilities provides a sophisticated low frequency velocity measurement system for use in identifying the coefficients in partial differential equation models of distributed mass structures. In addition, the vibrometer system provides straightforward and direct velocity feedback for such systems. These flexible structures characteristically have very low natural frequencies which cannot be detected by accelerometers. This system has and is being used to perform tests on models and sub-assemblies of large space structures for the purpose of evaluating existing identification and control strategies as well as to stimulate new research in the area of control, observers (estimators) and identification. Several intense experiments using the laser vibrometer were performed to measure the response of a quasi isotropic cantilevered beam with a removable tip mass excited by an impulse at various locations. This data was collected, stored, and sent to AFOSR researchers at Brown University transmitted using ETNET. The data was analyzed using a spline based estimation procedure, starting with a partial differential equation model of the structure. A clear advantage over modal methods based

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on a finite dimensional model of the same system was observed. (JHD)

DESCRIPTORS: (U) \*VIBRATION, \*LASER APPLICATIONS, \*REMOTE DETECTORS, ACCELEROMETERS, CANTILEVER BEAMS, COEFFICIENTS, COMPUTERS, CONTROL, CONTROL CENTERS, DATA ACQUISITION, DATA PROCESSING EQUIPMENT, DATA STORAGE SYSTEMS, DETECTION, DISTRIBUTION, ESTIMATES, FEEDBACK, FLEXIBLE STRUCTURES, INTENSITY, ISOTROPISM, LASERS, MASS, MASS STORAGE, MODELS, PARAMETERS, PARTIAL DIFFERENTIAL EQUATIONS, RESONANT FREQUENCY, SIZES(DIMENSIONS), SPACECRAFT, SPLINES, STRATEGY, STRUCTURES, TEST AND EVALUATION, VELOCITY, VERY LOW FREQUENCY.

IDENTIFIERS: (U) PE61802F, WUAFOSR2917A5.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 885 20/11 12/3

AD-A195 813 7/3

OHIO STATE UNIV COLUMBUS

WASHINGTON UNIV ST LOUIS MO DEPT OF CHEMISTRY

(U) Fatigue Crack Propagation: Probabilistic Modeling and Statistical Analysis.

(U) International Symposium on Organosilicon Chemistry (8th) Held in St. Louis Missouri on 7-12 June 1987.

DESCRIPTIVE NOTE: Final rept. 1 Jul 84-30 Jun 87,

DESCRIPTIVE NOTE: Final rept. 15 Oct 88-14 Oct 87,

MAR 88 9P

MAY 88 82P

PERSONAL AUTHORS: Blumenthal, Saul; Goel, Prem

PERSONAL AUTHORS: Gasper, Peter P.; Corey, Eugene R.; Corey, Joyce Y.

CONTRACT NO. AFOSR-84-0162

CONTRACT NO. AFOSR-87-0008

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A5

TASK NO. B2

MONITOR: AFOSR  
TR-88-0653MONITOR: AFOSR  
TR-88-0678

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This is the final report for a research grant to study probability models with application to fatigue crack propagation. Research problems considered included estimation with truncated data, burn-in reliability problems, and accelerated life testing. Keywords: Bibliographies; Abstracts. (KR)

ABSTRACT: (U) The Eighth International Symposium on Organosilicon Chemistry was held on June 7 to 12, 1987. The major subdivisions in which the oral and poster presentations were organized were: Silicon-Assisted Organic Synthesis; Organic Chemistry of Silicon; Silicon in Living Systems; Physical Chemistry, Theoretical Studies, Spectroscopy; Silicon Reactive Intermediates; Silicon-Silicon chemistry; Silicon -Oxygen Polymers and Materials; Inorganic Chemistry of Silicon; and Silicon in Solid State Technology. (AW)

DESCRIPTORS: (U) \*CRACK PROPAGATION, \*FATIGUE(MECHANICS), \*MATHEMATICAL MODELS, ACCELERATED TESTING, LIFE TESTS, PROBABILITY, RELIABILITY, STATISTICAL ANALYSIS, TRUNCATION, BIBLIOGRAPHIES, ABSTRACTS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5.

DESCRIPTORS: (U) \*ORGANIC COMPOUNDS, \*SILICON COMPOUNDS, CHEMISTRY, INORGANIC CHEMISTRY, INTERNATIONAL, LIFE(BIOLOGY), ORGANIC CHEMISTRY, OXYGEN, PHYSICAL CHEMISTRY, POLYMERS, SILICON, SILICON DIOXIDE, SPECTROSCOPY, SYMPOSIA, THEORY.

IDENTIFIERS: (U) Organic silicon compounds.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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VERMONT UNIV BURLINGTON DEPT OF PSYCHIATRY

(U) Role of Protein Phosphorylation in the Regulation of  
Neuronal Sensitivity.

\*PROTEINS, ANTIBODIES, CELLS, CENTRAL NERVOUS SYSTEM,  
CLONES, DOCUMENTS, NERVE TRANSMISSION, NERVOUS SYSTEM,  
ORIENTATION(DIRECTION), PHOSPHOPROTEINS, REGULATIONS,  
RESPONSE, SENSE ORGANS, SENSITIVITY, SUBSTRATES.

DESCRIPTIVE NOTE: Final rept. 1 Sep 84-29 Feb 88,

IDENTIFIERS: (U) PE81102F, MUAFOSR2312A2.

APR 88

PERSONAL AUTHORS: Ehrlich, Yigal H.

CONTRACT NO. AFOSR-84-0331

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-88-0682

UNCLASSIFIED REPORT

ABSTRACT: (U) Four main directions of investigation have been pursued. Progress has been made in each. First, the endogenous protein phosphorylation systems in various subcellular fractions of neural cells differentiated in culture have been identified and characterized. Second, we have obtained direct evidence for ecto-protein kinase activity at the surface of neural cells and identified its specific protein substrates. Third, a method for preparing and screening monoclonal antibodies against specific neuronal phosphoproteins has been developed and implemented in our laboratory. Finally, studies of the above systems in primary cultures of brain neurons have been initiated. Several manuscripts describing these novel findings are currently prepared in addition to those already published. Studies on the functional role of protein phosphorylation systems in processes underlying neuronal responsiveness have been initiated during year 02 of this project, using both neural cell lines and primary CNS neurons. In year 03 of the project our research focused on the extracellular protein phosphorylation systems of neostriatal cells differentiated in culture. Keywords: Nerve transmission; Neuronal phosphoproteins; Receptor sensitivity; Ecto-protein kinase. (KT)

DESCRIPTORS: (U) \*BRAIN, \*NERVE CELLS, \*PHOSPHORYLATION,

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## DTIC REPORT BIBLIOGRAPHY

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

NORTH STAR RESEARCH INC NY

(U) Computation of Low-Speed Compressible Flows with Time-  
Marching Procedures.

88 40P

PERSONAL AUTHORS: Merkle, Charles L.; Choi, Yun-Ho

CONTRACT NO. AFOSR-82-0196

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0469

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) The extension of time-marching procedures to low Mach number and low Reynolds number conditions is considered. It is shown that the disparate speeds of the acoustic and particle waves prevents convergence at high Reynolds numbers while the requirement that both the Courant and the von Neumann numbers be of order one prevents convergence in very viscous flows. A perturbation expansion is used to introduce pseudo-acoustic waves that propagate at speeds similar to the particle speed at high Reynolds numbers and that allows both the inviscid and viscous time step parameters to be of order one at low Reynolds numbers. The resulting algorithm is shown to give convergence rates that are independent of either Mach number or Reynolds number over a range of five orders of magnitude in both parameters. Results are shown for strong heat addition in low speed flow encompassing this broad range of variables. (NLM)

**DESCRIPTORS:** (U) ACOUSTIC WAVES, ADDITION, ALGORITHMS, COMPRESSIBLE FLOW, CONVERGENCE, EXPANSION, FLOW, HEAT, HIGH RATE, LOW RATE, LOW VELOCITY, MACH NUMBER, PARTICLES, PERTURBATIONS, RATES, REYNOLDS NUMBER, VARIABLES, VELOCITY, VISCOUS FLOW.

IDENTIFIERS: (U) WUAFOSR2308A1, PEG1102F.

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DESCRIPTIVE NOTE: Final rept. 15 Sep 87-14 Mar 88.

MAY 88 23P

PERSONAL AUTHORS: Benjaminson, M. A.; Lehrer, S.; Rale, R.

CONTRACT NO. F49620-87-C-0110

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-88-0648

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) On the basis of analyses of commercial technical information and searches of engineering and scientific data bases concomitant with detailed planning sessions and discussions it has been concluded: (1) a SITS-based system will provide the desired capability of discriminating between living and dead cells enabling the measurement of cytotoxicity, (2) the concept of an automated FCVC is feasible, (3) commercial cell sorters cannot perform the functional options ascribed to the FCVC, for the most part, and where this capability is claimed, they cannot perform them as cost effectively and efficiently, (4) the relative simplicity of the proposed FCVC environments and reduce the level of training required for operating personnel. The original design concepts have been modified to include replacement of the original double pass sighting system with a more efficient single pass one, an electrostatically controlled flow chamber, an option for segregation and selection of resistant cells for future study an one for one the possible detection and enumeration of specific virus particles. In Phase II, it is planned to build a breadboard/demonstration unit of the prototype FCVC. This unit will be used to study the FCVC's principles of operation, to test and choose components and to determine

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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the operating parameters of the instrument. This will include the development of operating standards and quality control protocols. Keywords: Toxicity, Cells(Biology), Laboratory equipment, Biological stains, Counting methods. (kt)

DESCRIPTORS: (U) \*BIOASSAY, \*TOXICITY, \*COUNTING METHODS, CELLS(BIOLOGY), LABORATORY EQUIPMENT.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2312A5, \*Fluorescent cell viability counter.

DARTMOUTH COLL HANOVER N H DEPT OF CHEMISTRY

(U) The First Transition Metal Complex Containing a Co-Ordinated Vinylcyclopropene and Its Photochemical Ring Expansion to give an n4-Cyclobutadiene Ligand.

88 4P

PERSONAL AUTHORS: Hemond, Richard C.; Hughes, Russell P.

CONTRACT NO. AFOSR-88-0075

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-88-0523

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society, Chemical Communications, p319-320 1988.

ABSTRACT: (U) 1,2,3-Triphenyl-3-trifluorovinylcycloprop-1-ene (1a) reacts with (Fe2(Co)8) to give the first example of a complex containing a co-ordinated n2-vinylcyclopropene, on subsequent irradiation an unprecedented ring expansion reaction occurs to give the n4-cyclobutadiene complex (4). Keywords: Propenes, Cyclic compounds, Reprints. (KUM)

DESCRIPTORS: (U) CYCLIC COMPOUNDS, EXPANSION, IRRADIATION, PHOTOCHEMICAL REACTIONS, PROPENES, REPRINTS, RESPONSE, RINGS, TRANSITION METALS.

IDENTIFIERS: (U) WUAFOSR2303B2, PEB1102F.

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CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB

STANFORD UNIV CA EDWARD L GINZTON LAB OF PHYSICS

(U) Joint Services Electronics Program.

(U) Application of Nondestructive Testing Techniques to Materials Testing.

DESCRIPTIVE NOTE: Annual progress rept. 1 May-31 Dec 87.

DESCRIPTIVE NOTE: Final rept. 1 Jan 84-30 Nov 87.

FEB 88 99P

DEC 87

PERSONAL AUTHORS: Oldham, W. G.

PERSONAL AUTHORS: Kino, G. S.

REPORT NO. UCB/ERL-87/1

CONTRACT NO. AFOSR-84-0083

CONTRACT NO. F49620-87-C-0041

PROJECT NO. 2305

PROJECT NO. 2306

TASK NO. A9

TASK NO. A3

MONITOR: AFOSR

MONITOR: AFOSR

TR-88-0589

TR-88-0687

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) As part of a project to construct, model and compare very high performances Si and GaAs devices, deep-submicron Si MOSFETs have been investigated. Using a novel optical lithography process, these extremely high-gain MOSFETs with varying oxide thicknesses and channel lengths have been fabricated. Figure 1 shows a Scanning Electron Microscope(SEM) picture of a transistor cross-section with an effective channel length 0.2 micron, an oxide thickness of 86 A, and junction depth of 0.2 micron. Devices with effective channel lengths as small as 0.15 micron and oxide thickness as thin as 36 A have been successfully fabricated and operated. (rh)

DESCRIPTORS: (U) \*SEMICONDUCTORS, \*ELECTRONICS, GALLIUM, CHANNELS, HIGH GAIN, JUNCTIONS, LENGTH, LITHOGRAPHY, MOSFET SEMICONDUCTORS, OPTICAL PROPERTIES, OXIDES, THICKNESS, TRANSISTORS.

IDENTIFIERS: (U) WUAFOSR2305A9, PE81102F, SUBMICRON CHANNELS.

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ABSTRACT: (U) A set of new techniques in scanning acoustic and optical microscopy is described. Starting with an acoustic microscope that can directly measure both phase and amplitude, similar techniques have been developed for the scanning optical microscope. These make it possible to measure range to a thousandth of a wavelength. Other techniques involving scanning optical microscopy have been demonstrated which make it possible to carry out profiling of semiconductor circuits. Developments of these methods are now being actively pursued for use in the semiconductor industry. Developments of acoustic technology pioneered on this program have proved extremely important for measuring internal defects in composites and surface cracks on ceramics. Keywords: Aircraft, Composite Materials, Ceramics, Integrated circuitry, Structural members, Phase measurement, Metal films, Epoxy compounds, Fiber optics, JES

DESCRIPTORS: (U) \*AIRCRAFT, \*ALLOYS, \*COMPOSITE MATERIALS, \*CRACKS, \*NONDESTRUCTIVE TESTING, ACOUSTIC MICROSCOPES, ACOUSTICS, CERAMIC MATERIALS, EPOXY COMPOUNDS, FIBER OPTICS, INDUSTRIES, MEASUREMENT, METAL FILMS, MICROSCOPES, OPTICAL ANALYSIS, OPTICAL EQUIPMENT, OPTICAL SCANNING, PHASE MEASUREMENT, SEMICONDUCTOR DEVICES, SEMICONDUCTORS, STRUCTURAL MEMBERS, SURFACES, JES

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SEARCH CONTROL NO. EVI48A

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TEST AND EVALUATION, TEST METHODS.

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

IDENTIFIERS: (U) WJAFOSR2308A3, PES1102F.

(U) Mechanisms of Chemical Modulation and Toxicity of the Immune System.

IAC NO. NT-40549

IAC DOCUMENT TYPE: NTIAC - MICROFICHE --

DESCRIPTIVE NOTE: Annual rept. 15 Apr 87-14 Apr 88,

MAY 88

IAC SUBJECT TERMS: N--(U)AIRCRAFT, COMPOSITE MATERIALS, CERAMICS, INTEGRATED CIRCUITS, STRUCTURAL MEMBERS, PHASE MEASUREMENT, METAL FILMS, EPOXY, COMPOUNDS, FIBER OPTICS;

PERSONAL AUTHORS: Tarr, Melinda J.; Olsen, Richard G.

CONTRACT NO. AFOSR-86-0129

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-88-0850

UNCLASSIFIED REPORT

ABSTRACT: (U) The results of experiments performed during this reporting period assess possible mechanisms involved in immunoregulation by 1,1-Dimethylhydrazine (UDMH). Treatment of mice with UDMH suppresses activity and production of interleukin-1 (L1) by partially blocking (IL1) receptor expression. Interleukin-2 (IL2) activity and production was also suppressed by UDMH, although the basal level of IL2 receptor was not affected. UDMH may partially reverse the immunosuppressive effects of Corynebacterium parvum in mice by interfacing with pGE2 production, but not hydrogen peroxide. Preliminary results show UDMH may affect murine splenic T-lymphocyte populations defined by helper/inducer (L3T4) and suppressor/cytotoxic (L3T2) monoclonal antibodies. Antigen presenting B-cells and macrophage also show variable Ia antigen expression upon exposure to UDMH. These experiments are just getting underway, but early results show UDMH increases intracellular Ca (++) within a few seconds of its addition to murine splenocytes in the resting state (without mitogen). The interaction of UDMH of intracellular Ca(++) levels could help define mechanisms of UDMH-induced immunomodulation. Keywords: Toxicity. (AW)

DESCRIPTORS: (U) \*IMMUNITY, \*IMMUNOSUPPRESSION, ANTIBODIES, ANTIGENS, CHEMICALS, CLONES, CORYNEBACTERIUM,

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HYDROGEN PEROXIDE, INDUCTANCE, MICE, MODULATION,  
PHAGOCYTES, PRODUCTION, RETICULOENDOTHELIAL SYSTEM, SENSE  
ORGANS, TOXICITY.

HARRIS CORP MELBOURNE FL GOVERNMENT AEROSPACE SYSTEMS  
DIV

IDENTIFIERS: (U) WUAFOSR2312A5, PE61102F.

(U) Robust, Reduced-Order, Nonstrictly Proper State  
Estimation via the Optimal Projection Equations with  
Petersen-Hollot Bounds.

DESCRIPTIVE NOTE: Journal article,

87 10P

PERSONAL AUTHORS: Haddad, Wassim M.; Bernstein, Dennis S.

CONTRACT NO. F49620-86-C-0002

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0534

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Systems & Control Letters, v8  
p423-431 1987.

ABSTRACT: (U) A state estimation design problem  
involving parametric plant uncertainties is considered.  
An error bound suggested by recent work is utilized for  
guaranteeing robust estimation. Necessary conditions  
which generalize the optimal projection equations for  
reduced-order state estimation are used to characterize  
the estimator which minimizes the error bound. The design  
equations thus effectively serve as sufficient conditions  
for synthesizing robust estimators. An additional feature  
is the presence of a static estimation gain in  
conjunction with the dynamic (Kalman) estimator, i.e., a  
nonstrictly proper estimator. Keywords: Robust Kalman  
filter; Error bounds; Reduced order state estimation;  
Reprints. (Jhd)

DESCRIPTORS: (U) \*KALMAN FILTERING, EQUATIONS, ERRORS,  
ESTIMATES, GAIN, OPTIMIZATION, REDUCTION, REPRINTS,  
STATICS.

IDENTIFIERS: (U) WUAFOSR2304A1, PE61102F, Petersen  
Hollot bounds.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 706 7/3 DARTMOUTH COLL HANOVER N H DEPT OF CHEMISTRY  
AD-A195 708 CONTINUED  
IDENTIFIERS: (U) WUAFUSR2303B2, PE01102F.

(U) Unprecedented Bonding of a Coordinated Polyenyyl Ligand.  
Synthesis and Molecular Structures of fac-  
Trialkyltricarboonyliron Compounds Containing the n3-  
Nonafluorocycloocta-2,5-diene-1,4,7-triyl Ligand and  
Its Derivatives.

87

PERSONAL AUTHORS: Carl, Richard T.; Hughes, Russell P.;  
Johnson, Jocelyn A.; Davis, Raymond E.; Kashyap, Ram P.

CONTRACT NO. AFOSR-86-0075

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-88-0522

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of American Chemical  
Society, v109 n22 1987.

ABSTRACT: (U) While hydrocarbon enyl and polyenyl  
ligands are ubiquitous in organotransition metal  
chemistry, (n3pentafluoroallyl)tricarboonylcobalt and the  
(n3afluorocyclohexenyl)tricarboonyliron anion appear to be  
the only reported examples of complexes containing  
perfluorinated enyl ligands. No compounds containing  
perfluoropolyenyl ligands have been reported. We now  
report that the perfluorocycloocta-2,5-diene-1,4,7-triyl  
ligand and its derivatives can be prepared by  
nucleophilic attack on coordinated  
octafluorocyclooctatetraene. These perfluoropolyenyl  
ligands bind to the metal via three sigma-bonds rather  
than through the pi-system of the polyenyl ring,  
affording the first examples of trialkyltricarboonylmetal  
complexes. Keywords: Reprints, Ligands, Polymers, Cyclic  
compounds. (mgm)

DESCRIPTORS: (U) \*LIGANDS, CYCLIC COMPOUNDS,  
HYDROCARBONS, MOLECULAR STRUCTURE, NUCLEOPHILIC REACTIONS,  
POLYMERS, REPRINTS, SYNTHESIS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A195 895 11/2

AD-A195 895 CONTINUED

SRI INTERNATIONAL MENLO PARK CA

(U) Further Study of the Dynamic Tensile Failure of Concrete.

DESCRIPTIVE NOTE: Final rept. 15 Jun 87-14 Feb 88,

APR 88 129P

PERSONAL AUTHORS: Gran, James K.; Seaman, Lynn

CONTRACT NO. F49620-87-0010

PROJECT NO. 2302

TASK NO. C2

MONITOR: AFOSR  
TR-88-0642

UNCLASSIFIED REPORT

**ABSTRACT:** (U) This report describes a small follow-up effort to a previous study of dynamic tensile failure of concrete in which our long-range objective is to understand and quantify the micromechanics of dynamic tensile failure of concrete. In the previous study, we developed an experimental technique to apply dynamic tension to 5-cm-diameter x 76-cm-long concrete rods at a strain rate of about 10/s, and we performed posttest computations with a simple one-dimensional strain softening model to interpret an initial set of experiments. In the current effort, our primary task was to scrutinize the technique for observing microcracks in damaged specimens and to quantify the microcracks in some of the specimens already tested. A second task was to computationally interpret more of the experimental results. Third, we made a preliminary step toward computing the strength and modulus of a material cell containing several interacting cracks. Three methods for inspecting the concrete specimens for microcracking were evaluated. The first method was to use a scanning electron microscope (SEM) to view the concrete surface. We found this method to be unsatisfactory because of extensive cracking caused by evacuating the specimen. The second method was to replicate the specimen surface with acetylcellulose replicating film and to view the film with the SEM. This method introduces uncertainties in

identifying cracks. The third method was to view a polished concrete surface with an optical microscope at a magnification of 100x. This is the preferred method for observing microcrack damage produced in the dynamic tension tests. (sdw)

**DESCRIPTORS:** (U) \*CONCRETE, \*FAILURE(MECHANICS), \*TENSILE STRENGTH, CELLS, COMPUTATIONS, CRACKS, DAMAGE, DYNAMIC TESTS, DYNAMICS, ELECTRON MICROSCOPES, ELECTRONIC SCANNERS, INTERACTIONS, LABORATORY PROCEDURES, MATERIALS, MECHANICS, MICROCRACKING, MICROSCOPES, OPTICAL EQUIPMENT, STRAIN RATE, SURFACES, TENSION.

**IDENTIFIERS:** (U) PEG1102F, WUAFOSR2302C2, LPN-SRI-PYU-3717.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 894 20/2 7/2

AD-A195 893 11/4

## ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

## RENSSELAER POLYTECHNIC INST TROY NY

(U) Electronic Materials and Devices Prepared by Molecular Beam Epitaxy.

(U) Processing Technology Research in Composites.

DESCRIPTIVE NOTE: Final rept. Nov 88-Sep 87.

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-30 Sep 87.

APR 88 8P

DEC 87 6P

PERSONAL AUTHORS: Morkoc, Hadis

PERSONAL AUTHORS: Diefendorf, Russell J.

CONTRACT NO. AFOSR-87-00#3

CONTRACT NO. AFOSR-87-0053

PROJECT NO. 2917

PROJECT NO. 2302

TASK NO. A3

TASK NO. B1

MONITOR: AFOSR  
TR-88-0683

MONITOR: AFOSR  
TR-88-0689

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Six Perkin Elmer 430P III-V MBE Systems and a PE Si MBE with appropriate transfer tubes for a totally interconnected MBE Complex has been purchased and installation has begun. The complex is located in the Coordinated Science Laboratory in Room 200 with the majority of administrative role being played by MRL. In this complex, two III-V MBE systems and a transfer tube (13 feet long) and the associated assortment of equipment has been paid for by funds obtained from AFOSR. These growth chambers have been termed as 'Growth Reactors A & B', with the transfer tube being called '1 Tube'. The systems are presently in CSL Room 200 which has been remodeled for this purpose and we are in the process of installing them. Epitaxial growth, Molecular beams. (mjm)

DESCRIPTORS: (U) CHAMBERS, ELECTRONIC EQUIPMENT, EPITAXIAL GROWTH, GROUP III COMPOUNDS, GROUP V COMPOUNDS, GROWTH(GENERAL), LABORATORIES, MANAGEMENT, MATERIALS, MOLECULAR BEAMS, TRANSFER, TUBES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2917A3.

ABSTRACT: (U) Chemical vapor deposition has been used for over fifteen years for depositing carbon matrices in carbon/carbon composites used for reentry nose-tips, rocket nozzle throat inserts, and aircraft brakes. The same technology is appropriate for depositing silicon carbide or other matrices in ceramic-ceramic composites, or ceramic/carbon composites. Furthermore, chemical vapor deposition is a powerful technique for applying the graded oxidation resistant coatings required for carbon/carbon composites in long time oxidizing environments. Modern instrumentation allows many variations in properties to be made which had been impossible in the past. It is for these reasons that we proposed the acquisition of a state-of-the-art Low Pressure Chemical Vapor Deposition Apparatus. (JES)

DESCRIPTORS: (U) CARBON CARBON COMPOSITES, ACQUISITION, AIRCRAFT, BRAKES, CARBON, CERAMIC MATERIALS, CHEMICAL REACTIONS, COMPOSITE MATERIALS, ENVIRONMENTS, LONG RANGE(TIME), NOZZLE INSERTS, NOZZLE THROATS, OXIDATION, OXIDATION RESISTANCE, PROCESSING, PROTECTIVE COATINGS, ROCKET NOZZLES, SILICON CARBIDES, VAPOR DEPOSITION.

IDENTIFIERS: (U) PE81102F, WUAFOSR2302B1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A195 692 12/8

AD-A195 690 20/8

ILLINOIS UNIV AT URBANA DEPT OF STATISTICS

COLORADO UNIV AT BOULDER

(U) Instrumentation for Computational Statistical Research.

(U) Optical Symbolic Computing.

DESCRIPTIVE NOTE: Final technical rept. 15 Jul-15 Nov 87.

DESCRIPTIVE NOTE: Annual rept. May 87-Apr 88.

FEB 88

APR 88

PERSONAL AUTHORS: Sacks, Jerome

PERSONAL AUTHORS: Cathey, W. T.; Schmidt, Rodney A.

CONTRACT NO. AFOSR-67-0041

REPORT NO. CU-1538935

PROJECT NO. 2304

CONTRACT NO. AFOSR-88-0189

TASK NO. A5

PROJECT NO. 2305

MONITOR: AFOSR  
TR-88-0839

MONITOR: AFOSR  
TR-88-0881

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

DESCRIPTORS: (U) \*COMPUTERS, STATISTICAL ANALYSIS,  
COMPUTATIONS, RESEARCH MANAGEMENT, NETWORKS, STATIONS,  
MATHEMATICAL MODELS, COMPUTATIONS, STATISTICS.

ABSTRACT: (U) This report describes the results of the work on optical symbolic computing that was performed on grant AFOSR-88-0189 during the second year of the three year program. The detail of the research is in the appended papers. This section of the report is to summarize the motivation for the work, the reasons for the approach taken, and the results. First, a rationale is given for the use of optics in A.I., and then the approach taken is described. The results of the research are then given. (RH)

DESCRIPTORS: (U) \*COMPUTATIONS, \*OPTICAL PROCESSING,  
\*OPTICS, MOTIVATION, SYMBOLS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2305B1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 689 6/11

AD-A195 689 CONTINUED

PURDUE RESEARCH FOUNDATION LAFAYETTE IN

(U) Early Phase Interactions of Toluene with Membranes: A Structural and Functional Evaluation.

DESCRIPTIVE NOTE: Annual Rept. 1 Jan-31 Dec 88.

JAN 87 11P

PERSONAL AUTHORS: Morre, James

CONTRACT NO. F49620-85-K-0003

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-88-0681

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The principal objective of the research conducted was to define the subcellular site(s) or target(s) of action of the aromatic hydrocarbon toluene. Confirmed target sites were then to be investigated in detail to elucidate possible mechanisms of toluene action in perturbing membrane structure that might be related to either an enhancement or loss of membrane function. The most sensitive cell component to toluene was the plasma membrane where a morphological response at and a response in terms of enzymatic activity was observed at 225 ppm both with treatment times of 5 min or less. Thus the plasma membrane is indicated as one important target for toluene intoxication. A second target identified was that of the transition region between endoplasmic reticulum and Golgi apparatus where transfer of material appears to be rapidly blocked by 100 ppm toluene or lower both in situ and in a cell free system newly developed to study this phenomenon. Subtle changes in membrane cytoskeleton interactions or in membrane fluidity involving boundary lipids of membrane proteins may provide the common denominator between these two points of toluene action at the subcellular level. Keywords: Toxicity. (aw)

**DESCRIPTORS:** (U) \*TOLUENES, \*TOXICITY, \*MEMBRANES(BIOLOGY), AROMATIC COMPOUNDS, BOUNDARIES, CELL

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STRUCTURE, CELLS, CELLS(BIOLOGY), ENZYMES, FIBERS, FLUIDS, FUNCTIONS, HYDROCARBONS, INTERACTIONS, INTOXICATION, LIPOIDS, LOSSES, MATERIALS, MEMBRANES, MORPHOLOGY(BIOLOGY), PLASMAS(PHYSICS), PROTEINS, RESPONSE(BIOLOGY), SENSITIVITY, SITES, STRUCTURAL PROPERTIES, TARGETS, TEST AND EVALUATION, TRANSFER, TRANSITIONS.

IDENTIFIERS: (U) Plasma membranes.

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

AD-A195 888

12/8

CLARKSON UNIV POTSDAM NY

(U) Acquisition of Multiple LISP Workstations to Facilitate Communications and Software Exchange within the Artificial Intelligence Consortium.

DESCRIPTIVE NOTE: Final rept. 1 Aug 86-14 Aug 87,

APR 88

PERSONAL AUTHORS: Cotellessa, Robert F.

CONTRACT NO. AFOSR-86-0285

PROJECT NO. 2917

TASK NO. A5

MONITOR: AFOSR  
TR-88-0671

## UNCLASSIFIED REPORT

ABSTRACT: (U) This grant acquired LISP workstations of the same manufacture and model for each of the eight universities that comprise the Artificial Intelligence Consortium in the Northeast U.S. The common type of workstation acquired is intended to facilitate software exchange with the aid of a communications network. Keywords: Artificial intelligence; LISP Workstations. (jhd)

DESCRIPTORS: (U) \*DATA PROCESSING TERMINALS, ACQUISITION, ARTIFICIAL INTELLIGENCE, COMMUNICATIONS NETWORKS, COMPUTER PROGRAMS, CONSORTIUMS, EXCHANGE, STATIONS, UNIVERSITIES, WORK.

IDENTIFIERS: (U) PE61102F, WJAFOSR2517A5.

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MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) Use of Tyrosine or Foods to Amplify Catecholamine Release.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 87,

FEB 88

3P

PERSONAL AUTHORS: Wurtman, Richard

CONTRACT NO. AFOSR-87-0027

PROJECT NO. 2917

TASK NO. A4

MONITOR: AFOSR  
TR-88-0680

## UNCLASSIFIED REPORT

ABSTRACT: (U) Grant funds were used to purchase a multi-detector liquid chromatography system consisting of: BioRad AS-48 refrigerated automatic injector; Hewlett-Packard HP1090 with workstation, software, and fast UV-Vis spectral detector, Berthold LB 508-C radiostope detector, and an ESA 5100A Coulchem detector. The major equipment has been used to compare several methods of amino acid analysis. At present, we are using pre-column derivitization with OPI with full-spectrum detection. The initial studies have focussed on resolving threonine, glycine, and histidine peaks for a study of CSF samples. Work is beginning on our project on amino acid analysis of retinal superfusates (and, possibly, tissues). (AW)

DESCRIPTORS: (U) \*CATECHOLAMINES, \*SECRETION, AMINO ACIDS, COMPUTER PROGRAMS, FOOD, GLYCINE, HISTIDINE, RELEASE, TYROSINE, RETINA.

IDENTIFIERS: (U) Superfusates.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A195 685 CONTINUED

AD-A195 685 20/11 22/1 13/9

IOWA UNIV IOWA CITY CENTER FOR COMPUTER AIDED DESIGN

(U) Dynamics of Articulated Aerospace Structures.

DESCRIPTIVE NOTE: Final Report, 1 Dec 85-30 Nov 87.

APR 88

PERSONAL AUTHORS: Haug, Edward J.

CONTRACT NO. AFOSR-86-0082

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-88-0670

UNCLASSIFIED REPORT

**ABSTRACT:** (U) A unified variational approach to dynamics of flexible multibody systems has been developed and demonstrated on several test problems, including a deployable space structure, flexible manipulators with feedback control, spinning blades, impacting elastic bodies, and variety of mechanisms. A new recursive formulation was developed for dynamics of flexible multibody systems. This new formulation demonstrated in excess of an order of magnitude speed up in computation, compared to the Cartesian coordinate approach, with comparable accuracy and improved stability. A substructuring formulation that accounts for geometrically nonlinear deformation effects in spinning blades and large space structures was developed and demonstrated, using both the Cartesian coordinate and recursive relative coordinate formulations. The substructure technique was further extended to account for contact-impact effects between structural components. A new formulation of translational joints between flexible bodies was developed, to account for deformation due to sliding contacts. **Keywords:** Articulated structures. (Jhd)

**DESCRIPTORS:** (U) \*FLEXIBLE STRUCTURES, \*SPACE STATIONS, \*JOINTS, ACCURACY, AEROSPACE CRAFT, BLADES, BODIES, CARTESIAN COORDINATES, CONTROL, COORDINATES, DEFORMATION, DYNAMICS, ELASTIC PROPERTIES, FEEDBACK, FORMULATIONS,

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GEOMETRIC FORMS, IMPACT, MANIPULATORS, NONLINEAR ANALYSIS, RECURSIVE FUNCTIONS, SLIDING CONTACTS, SPACECRAFT, SPINNING(MOTION), STRUCTURAL MEMBERS, STRUCTURES, TEST AND EVALUATION, VELOCITY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR230281.



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SEARCH CONTROL NO. EVI48A

AD-A195 684

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AD-A195 683

20/3

FLORIDA UNIV GAINESVILLE

POLYTECHNIC INST OF NEW YORK FARMINGDALE WEBER RESEARCH INST

(U) Molecular Interactions with Many-Body Methods.

(U) Millimeter Wave Generation by Relativistic Electron Beams.

DESCRIPTIVE NOTE: Final rept. 1 Nov 84-31 Oct 87,

DESCRIPTIVE NOTE: Final rept. 1 Nov 86-31 Oct 87,

MAR 88

SP

PERSONAL AUTHORS: Bartlett, Rodney J.

PERSONAL AUTHORS: Kuo, Spencer P.

CONTRACT NO. AFOSR-85-0011

CONTRACT NO. AFOSR-87-0040

PROJECT NO. 2301

PROJECT NO. 2817

TASK NO. A4

TASK NO. A6

MONITOR: AFOSR  
TR-88-0679

MONITOR: AFOSR  
TR-88-0675

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarized publications and invited presentations supported by our AFOSR grant on 'Molecular Interactions with Many-Body Methods'. In this effort new many-body methods have been developed to treat open-shell molecules; to apply to properties like moments, polarizabilities, hyperpolarizabilities, spin-densities and spin-spin coupling constants; infra-red spectra; and a variety of applications to interesting molecules including the unknown metastable N3H3 system. The latter molecule, though isoelectronic with ozone and cyclopropane is not known experimentally. However, we find that it should exist in three stable structures. Furthermore, we have pre-edited its IR spectra to aid in its experimental identification, which should be possible in matrix isolation. Other applications work has focused on the accurate, numerical orbital treatment of anions. (mjm)

DESCRIPTORS: (U) , ANIONS, CONSTANTS, COUPLING(INTERACTION), CYCLOPROPANES, IDENTIFICATION, INFRARED RADIATION, ISOLATION, MATRIX THEORY, MOLECULE MOLECULE INTERACTIONS, MOLECULES, MOMENTS, N BODY PROBLEM, NUMERICAL METHODS AND PROCEDURES, ORBITS, OZONE, POLARIZATION, SPECTRA, SPINNING(MOTION), STABILITY, STRUCTURES.

IDENTIFIERS: (U) PE01102F, WUAFOSR2301A4.

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ABSTRACT: (U) Under the support of this equipment grant, the facilities of the Plasma Laboratory of the Institute used for an on-going research program funded by the AFOSR have been upgraded. Our research program bears the scientific goal to develop a high power, compact microwave device carrying good output efficiency. A cusptron device is thus designed to fir the requirements. This device utilizes the negative mass instability for the resonant interaction between an axis-encircling electron beam and the modes of a slotted cylindrical waveguide. This beam configuration is produced by passing an electron beam through cusp magnetic field and maximizes the finite Larmor radius effect for harmonic cyclotron resonance interaction. Further, the slotted boundary introducing a periodic fringe field near the orbits of the electron beam, thus, enriches the resonant harmonic contents of the rf fields as experienced by the gyrating electrons. (jhc)

DESCRIPTORS: (U) \*CYCLOTRON RESONANCE, \*ELECTRON BEAMS, \*MILLIMETER WAVES, \*RADIOFREQUENCY GENERATORS, BOUNDARIES, CONFIGURATIONS, CYLINDRICAL BODIES, EFFICIENCY, ELECTRONS, HARMONICS, HIGH POWER, INTERACTIONS, LABORATORIES, MAGNETIC FIELDS, MASS, MICROWAVE EQUIPMENT, ORBITS, OUTPUT, PLASMAS(PHYSICS), RADIOFREQUENCY, RADIUS(MEASURE),

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AD-A195 883 CONTINUED

AD-A195 847 20/3

RELATIVITY THEORY, RESONANCE, SLOTS, STABILITY, WAVE  
PROPAGATION, WAVEGUIDES.

PRINCETON UNIV NJ DEPT OF PHYSICS

(U) Theory of Superconductivity in Oxides.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2917A8.

DESCRIPTIVE NOTE: Final technical rept.,

MAY 88 4P

PERSONAL AUTHORS: Anderson, P. W.

CONTRACT NO. AFOSR-87-0382

PROJECT NO. 2308

TASK NO. C1

MONITOR: AFOSR  
TR-88-0633

UNCLASSIFIED REPORT

ABSTRACT: (U) We made our greatest progress towards a final theory of high  $T_c$  superconductivity. The key elements are the work on normal state properties, and the actual mechanism for  $T_c$ . With the understanding (ZA) of the large anisotropy and other transport properties in the normal state, the model is uniquely determined: one must have one version or another of a holon-spinon quantum fluid state, which is not a normal fermi liquid. And with the recognition (HWA) of the large repulsion holon-holon interactions, we have the first way of thinking quantitatively about the superconducting state. Work on the pure Heisenberg system, which is related but not necessarily crucial to understanding the superconducting properties is described. Keywords: Transition temperature; Superconductors; Antiferromagnetics; Lanthanum Copper Oxides. (AW)

DESCRIPTORS: (U) \*SUPERCONDUCTORS, \*OXIDES, \*LANTHANUM COMPOUNDS, \*COPPER COMPOUNDS, ANTIFERROMAGNETISM, THEORY, COPPER, LANTHANUM, ANISOTROPY, FERMI SURFACES, LIQUIDS, SUPERCONDUCTIVITY, TRANSITION TEMPERATURE, TRANSPORT PROPERTIES.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2908C1.

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MASSACHUSETTS INST OF TECH CAMBRIDGE LAB FOR INFORMATION  
AND DECISION SYSTEMS

boundary value problems. (hde)

(U) Stability, Stochastic Stationarity and Generalized  
Lyapunov Equations for Two-Point Boundary-Value  
Descriptor Systems.

DESCRIPTORS: (U) \*BOUNDARY VALUE PROBLEMS, \*LYAPUNOV  
FUNCTIONS, EQUATIONS, INTERNAL, INTERVALS, LENGTH,  
STABILITY, VARIATIONS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A1.

MAR 88

PERSONAL AUTHORS: Nikoukhah, Ramine; Levy, Bernard C.;  
Willisky, Alan S.

REPORT NO. LIDS-P-1758

CONTRACT NO. DAAL03-88-K-0171, \$AFOSR-88-0032

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0630

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with  
California Univ., Davis, Dept. of Electrical Engineering  
and Computer Science. Sponsored in part by Grant NSF-EC87-  
00903.

ABSTRACT: (U) This paper introduces the concept of  
internal stability for two-point boundary-value  
descriptor systems (TPBVDs). Since TPBVDs are defined  
only over a finite interval, the concept of stability is  
not easy to formulate for these systems. The definition  
which is used here consists in requiring that as the  
length of the interval of definition increases, the  
effect of boundary conditions on states located close to  
the center of the interval should go to zero. Stochastic  
TPBVDs are studied, and the property of stochastic  
stationarity is characterized in terms of a generalized  
Lyapunov equation satisfied by the variance of the  
boundary vector. A second generalized Lyapunov equation  
satisfied by state variance of a stochastically  
stationary TPBVD is also introduced, and the existence  
and uniqueness of positive definite solutions to this  
equation is then used to characterize the property of  
internal stability. Keywords: Stability, Two-point

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LOWELL UNIV MA

MISSISSIPPI STATE UNIV MISSISSIPPI STATE DEPT OF  
AEROPHYSICS AND AEROSPACE ENGINEERING

(U) Research on Acoustic Coupling to Electromagnetic  
Pulses in Tissue.

(U) Generation of Surface Grids through Elliptic Partial  
Differential Equations for Aircraft and Missile  
Configurations.

DESCRIPTIVE NOTE: Final rept. 15 Feb 87-29 Apr 88.

APR 88

DESCRIPTIVE NOTE: Final rept. Jun 87-Mar 88.

PERSONAL AUTHORS: Moses, Harry E.

MAY 88 27P

CONTRACT NO. AFOSR-87-0151

PERSONAL AUTHORS: Warsi, Z. U.

PROJECT NO. 2304

REPORT NO. ASE-88-8

TASK NO. A4

CONTRACT NO. AFOSR-85-0143

MONITOR: AFOSR  
TR-88-0635

PROJECT NO. 2304

TASK NO. A3

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-88-0638

ABSTRACT: (U) Six papers were written and submitted for  
publications. Topics include: A Refinement of the Radon  
Transform and its Inverse; Exact Solutions of the Three-  
Dimensional Scalar Wave Equation from the Approximate  
Solutions in the Wave Zone Through the Use of the Radon  
Transform; Exact Solutions of Maxwell's Equations from  
the Approximate Solutions in the Wave Zone Through the  
Use of the Radon Transform; Propagation of an  
Electromagnetic Field through a Planar Slab; Generation  
of acoustic pulses in liquids by electromagnetic pulses,  
(kt)

DESCRIPTORS: (U) \*ACOUSTICS, \*ELECTROMAGNETIC WAVE  
PROPAGATION, \*ELECTROMAGNETIC PULSES,  
COUPLING(INTERACTION), ELECTROMAGNETIC FIELDS,  
TISSUES(BIOLOGY), LIQUIDS, MAXWELLS EQUATIONS, PLANAR  
STRUCTURES, PULSES, SCALAR FUNCTIONS, SOLUTIONS(GENERAL),  
THREE DIMENSIONAL, WAVE EQUATIONS, WAVES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A4.

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UNCLASSIFIED REPORT

ABSTRACT: (U) The main aim of the project was to develop  
a set of partial differential equations which are the  
most optimum for the generation of grid lines in  
arbitrary surfaces. Equations have been developed on the  
basis of differential-geometric concepts which are  
elliptic in character and look to be the most optimum  
among the class of equations which can be used to  
generate the surface coordinates. The developed equations  
require a specification of the forcing function which  
depends on the geometry of the given surface. The surface  
in which the coordinates are to be introduced is usually  
given in discrete data form. Methods have been developed  
which fit a function over the given data to evaluate the  
forcing function for complicated shapes, e.g., an  
airplane, the functional fit and the eventual grid  
generation for the fuselage and wings are done separately  
and then integrated to obtain the grid lines on the  
surface. (KR)

DESCRIPTORS: (U) \*WING BODY CONFIGURATIONS, \*PARTIAL  
DIFFERENTIAL EQUATIONS, AIRCRAFT, COORDINATES, ELLIPSES,  
EQUATIONS, FUSELAGES, GRIDS, GRIDS(COORDINATES), GUIDED

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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MISSILES, SURFACES, WINGS.

CALIFORNIA UNIV SANTA BARBARA DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

IDENTIFIERS: (U) PEG1102F, WJAFOSR2304A3, \*Guided  
missile configurations.

(U) Use of Depletion Edge Translation for High-Speed  
Modulation and Switching of Lightwaves.

DESCRIPTIVE NOTE: Annual rept. 1 Mar 87-29 Feb 88,

MAY 88

PERSONAL AUTHORS: Coldren, L. A.; Mendoza, J. G.; Hausken,  
T. R.; Lee, K. W.; Simes, R. J.

REPORT NO. CU-ECE-88-08

CONTRACT NO. AFOSR-85-0323

PROJECT NO. 2305

TASK NO. B4

MONITOR: AFOSR  
TR-88-0612

UNCLASSIFIED REPORT

ABSTRACT: (U) The main objective continues to be the achievement of large index shifts at low voltages for applications in modulators and switches for optical processing, the device area of application has shifted from the in-plane guided wave modulator vehicle to a surface-normal modulator configuration more appropriate for spatial light modulator arrays, optical logic gates and reconfigurable optical interconnection. However, in the course of building up the surface-normal effort in the early portion of this reporting period, we also were wrapping up some important in-plane results. Thus, since these results were not previously reported, they are briefly summarized here. Keywords: Optical waveguides; Optical switching. (jnc)

DESCRIPTORS: (U) \*LIGHT MODULATORS, \*OPTICAL SWITCHING, \*LIGHT, ARRAYS, CIRCUIT INTERCONNECTIONS, DEPLETION, EDGES, GATES(CIRCUITS), HIGH RATE, INDEXES, LOGIC CIRCUITS, LOW VOLTAGE, MODULATION, MODULATORS, OPTICAL PROCESSING, OPTICAL PROPERTIES, OPTICAL WAVEGUIDES, SHIFTING, SPATIAL DISTRIBUTION, TRANSLATIONS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A195 608 20/3 19/6 20/9

IDENTIFIERS: (U) WUAFOSR230584, PE81102F

MIAMI UNIV CORAL GABLES FLA

(U) Theoretical Modeling of Accelerating Arc Plasmas.

DESCRIPTIVE NOTE: Final rept. 31 Jul 84-31 Jul 87.

APR 88

PERSONAL AUTHORS: Huerta, Manuel A.

CONTRACT NO. AFOSR-84-0118

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR  
TR-88-0578

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The researchers present a calculation in a simplified geometry for the current distribution in the rails, taking into account the motion of the armature and the time variation of the current. Closed form, asymptotic, results for the current density are obtained for arbitrary time dependent electrical conductivity of the rails, and  $v$  is the speed of the armature. Because of eddy current effects the rail current may reverse in portions of the rails when the total current decreases. The current is used as a source of Joule heating to find the temperature distribution in the rails. The heat diffusivity is negligible and give numerical results concerning melting. Keywords: Railguns; Plasma heating; Magnetohydrodynamics. (Jnd)

**DESCRIPTORS:** (U) \*HYPERVELOCITY GUNS, \*ARC HEATING, \*PLASMA ACCELERATORS, ARMATURES, CURRENT DENSITY, DIFFUSIVITY, DISTRIBUTION, EDDY CURRENTS, ELECTRICAL CONDUCTIVITY, GEOMETRY, HEAT, HEATING, MAGNETOHYDRODYNAMICS, MODELS, MOTION, NUMERICAL ANALYSIS, PLASMAS(PHYSICS), RAILS, SIMPLIFICATION, SOURCES, TEMPERATURE, THEORY, TIME, TIME DEPENDENCE, VARIATIONS, VELOCITY.

IDENTIFIERS: (U) WUAFOSR2301A6, PE81102F.

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AD-A195 597 11/8.1 20/8 20/2

AUBURN UNIV AL DEPT OF MECHANICAL ENGINEERING

(U) Crystal Structures of Ordered Carbon Metal Alloys.

DESCRIPTIVE NOTE: Final rept. 1 Sep 86-29 Feb 88.

88 5P

PERSONAL AUTHORS: Chin, Bryan A.

CONTRACT NO. AFOSR-86-0233

PROJECT NO. 2917

TASK NO. A3

MONITOR: AFOSR  
TR-88-0532

UNCLASSIFIED REPORT

ABSTRACT: (U) This scientific instrumentation grant was awarded to Auburn University for the examination of crystal structures of the various ordered carbon metal alloy systems. The major instrument purchased was a high temperature x-ray diffractometer for in-situ phase identifications. The following instruments were purchased under this grant. X-ray Powder Diffractometer, High precision ion mill, High precision dilpale system for sample preparation. (JES)

DESCRIPTORS: (U) \*CARBON ALLOYS, \*CRYSTAL STRUCTURE, \*METALS, DIFFRACTOMETERS, HIGH TEMPERATURE, POWDERS, X RAY DIFFRACTION.

IDENTIFIERS: (U) PE81102F, WUAFOSR2917A3.

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CONTROL DATA CORP MINNEAPOLIS MN METEOROLOGY RESEARCH CENTER

(U) Utilization of a Single Clear-Air Doppler Radar Beam to Measure Vertical Divergence.

MAR 88

PERSONAL AUTHORS: Clark, W. L.; Nastro, G. D.; Gage, K. S.; Green, J. L.; Strauch, R. G.

CONTRACT NO. F49620-88-C-0027, NSF-ATM85-12513

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-88-0498

UNCLASSIFIED REPORT

ABSTRACT: (U) Clear-air Doppler radars, also called wind profilers, have the almost unique capability to profile the vertical air motion over the radar on a nearly continuous basis. Clark et al. (1986) point out that partial of w with respect to z, the vertical divergence component, may easily be obtained from these measurements through simple height differencing. This technique is sensitive to all scales of motion and should be complementary to values of horizontal velocity divergence determined from the NWS rawinsonde network or those obtained from the future clear-air Doppler radar networks (see Chadwick and Hassel. 1987), using techniques similar to those of Zamora et al. (1987). (RH)

DESCRIPTORS: (U) \*DOPPLER RADAR, AIR, CLEAR AIR TURBULENCE, MOTION, NETWORKS, RADAR, RADIOSONDES, SCALE, VERTICAL ORIENTATION, WIND.

IDENTIFIERS: (U) PE81102F, WUAFOSR2310A1.

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AD-A195 539 8/4 17/6 12/6 14/2

AD-A195 528 7/4

MONTANA UNIV MISSOULA

MINNESOTA UNIV MINNEAPOLIS

(U) Relationships Among Earth's Gravity Field, Magnetic Field, Crustal Structure and the Magnetic Character of crustal Rocks.

DESCRIPTIVE NOTE: Final rept. 1 Oct 88-30 Sep 87.

DEC 87

PERSONAL AUTHORS: Sheriff, Steven D.

CONTRACT NO. AFOSR-87-0025

PROJECT NO. 2918

TASK NO. A6

MONITOR: AFOSR  
TR-88-0549

## UNCLASSIFIED REPORT

ABSTRACT: (U) The equipment has been purchased and received. It is currently in a phase of beta-testing with a research project on the edge of the Idaho Batholith in western Montana. The equipment includes: A. Sun Microsystems 3/110 workstation with supporting software and manuals. This includes a floating point accelerator, modem and 0.25 inch tape drive; Compatible Sun Laserwriter and Hewlett Packard color-dot printer; B. Summagraphics 42 x 80 inch microgrid II digitizing table and microcomputer interface; C. Schonstedt SSM-2A spinner magnetometer; Advance Magnetics magnetic shield assemblies; Schonstedt DM-2220 digital magnetometer; D. 10 kiloGauss Alpha Scientific electromagnet including the matched reversible power supply; and E. Bartington Instruments digital magnetic susceptibility meter. (JHD)

DESCRIPTORS: (U) \*EARTH CRUST, \*GRAVITATIONAL FIELDS, \*MAGNETIC FIELDS, \*ROCK, COMPUTER PROGRAMS, DRIVES, EARTH(PLANET), ELECTROMAGNETS, FLOATING BODIES, INTERFACES, MATCHING, MICROCOMPUTERS, MODEMS, MONTANA, PARTICLE ACCELERATORS, POWER SUPPLIES, REVERSIBLE, SUN, TAPES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2817A6.

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(U) American Conference on Theoretical Chemistry Held in Gull Lake, Minnesota on July 25-31, 1987.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-3 Oct 87.

88

PERSONAL AUTHORS: Truhler, Donald G.

CONTRACT NO. AFOSR-87-0009

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-88-0428

## UNCLASSIFIED REPORT

ABSTRACT: (U) The 1987 American Conference on Theoretical Chemistry was held at Gull Lake, Minnesota. In recent years the conference has broadened to include all of theoretical chemistry. Lectures at the 1987 conference were devoted to typically followed by 15 minutes of plenary discussion. Special thanks goes to the session chairman for their role in leading these discussions: Bill Goddard, Mark Child, David Chandler, Reinhold Schirke, William Miller, Pekka Pyykko, John Wheeler, Per Sigbahn, and Kenneth Jordan. In addition there were 252 official posters (plus a few unannounced ones), all of which were posted all week in pleasant, sunny rooms (and a few corridors!) to promote further discussion. Keywords: Symposia. (kt)

DESCRIPTORS: (U) \*QUANTUM CHEMISTRY, CHEMISTRY, JORDAN, MINNESOTA, SYMPOSIA.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B3.



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AD-A195 505 12/9 12/1

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF CIVIL  
ENGINEERING

(U) Feasibility Study of a Knowledge Based Finite Element  
Modeling Assistant.

ELEMENT ANALYSIS, DECISION MAKING, EVOLUTION(GENERAL),  
FEASIBILITY STUDIES, MATHEMATICAL MODELS, MEMORY DEVICES,  
MODELS, REQUIREMENTS, SPATIAL DISTRIBUTION,  
SPECIALIZATION, STRATEGY, PROBLEM SOLVING, COMPUTER  
ARCHITECTURE.

DESCRIPTIVE NOTE: Final rept. 1 Dec 88-30 Nov 87,

IDENTIFIERS: (U) Knowledge based system, Expert systems,  
PE81102F, WIAFOSR2302B1.

FEB 88 48P

PERSONAL AUTHORS: Turkiyyah, George; Fenves, Steven J.

REPORT NO. R-88-188

CONTRACT NO. AFOSR-87-0082

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-88-0859

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this study is to explore the technical feasibility and issues involved in a broad cooperative effort to develop a knowledge-based expert system (KBES) environment for finite element modeling and analysis assistance. The environment is intended to serve the dual requirements of providing specialization capabilities to individual organizations so that they can 'customize' the KBES to reflect their own expertise and generalization capabilities to serve as a 'community memory' of the discipline. This report presents an architecture for such an environment. The key elements of the architecture are: a hierarchical, multiple-views representation of the spatial and functional characteristics of structural systems; an explicit representation and manipulation of modeling assumptions which allows fine-grained control over model synthesis; and an evolutionary model development strategy whereby modeling decisions can be methodically modified or retracted after an analysis iteration to generate more appropriate models. Keywords: Artificial intelligence; Mathematical models.

DESCRIPTORS: (U) \*ARTIFICIAL INTELLIGENCE, \*FINITE

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AD-A195 504 14/2 20/9

YALE UNIV NEW HAVEN CT DEPT OF APPLIED PHYSICS

(U) Investigation of Superradiant LDV Markers and Three-Component Velocity Mapping.

DESCRIPTIVE NOTE: Final rept. 1 Jan 85-31 Dec 87.

MAR 88 29P

PERSONAL AUTHORS: Chang, Richard K.; Long, Marshall B.; Kuc, Roman

CONTRACT NO. F48620-85-K-0002

PROJECT NO. 2308

TASK NO. A3

MONITOR: AFOSR  
TR-88-0841

UNCLASSIFIED REPORT

ABSTRACT: (U) Research areas were: 1) micrometer-size droplets; 2) three-dimensional scalar mapping; and 3) three-dimensional velocity mapping. Nonlinear optical interactions in a droplet occur at remarkably low input intensity levels because the droplet acts as a lens to concentrate the input radiation at a location just within the shadow face and as an optical cavity to provide feedback for the internally generated radiation. The following nonlinear optical effects have been observed in single droplets: lasing; stimulated Raman scattering up to the 14th order; coherent Raman gain due to the presence of another input wave; phase-modulation broadening of the elastically scattered and stimulated Raman scattered radiation; delay time in generating the multiorder stimulated Raman scattering; and effective Q-factor of the droplet cavity based on a lifetime measurement of the radiation trapped within the droplet. Laser-induced breakdown within the droplet occurs when the rising portion of the input laser pulse causes multiphoton ionization, which is followed by cascade multiplication. The resultant plasma within the droplet transforms a nominally transparent droplet into an absorbing droplet, and the remaining portion of the input laser pulse heats the droplet. Plasma is ejected from the droplet, first from the shadow face and then from the

illuminated face. Once the plasma has been quenched, the droplet undergoes explosive vaporization. Three-dimensional scalar mapping was made possible by sweeping the laser illumination sheet and by recording scattered images on a high-speed framing camera.

DESCRIPTORS: (U) \*LASER VELOCIMETERS, \*PLASMAS(PHYSICS), CAVITIES, COHERENCE, DELAY, DROPS, EXPLOSIVES, GAIN, ILLUMINATION, IMAGES, INPUT, INTENSITY, INTERACTIONS, INTERNAL, LASERS, LENSES, LEVEL(QUANTITY), LIGHT SCATTERING, LOW LEVEL, MAPPING, MARKERS, MEASUREMENT, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, OPTICS, PHOTOIONIZATION, PULSED LASERS, RADIATION, RAMAN SPECTRA, RECORDING SYSTEMS, SCALAR FUNCTIONS, SCATTERING, STIMULATION(GENERAL), THREE DIMENSIONAL, TIME, TRANSPARENCY, VAPORIZATION, VELOCITY, DOPPLER SYSTEMS, Q FACTORS, PLASMA WAVES.

IDENTIFIERS: (U) Superradiance, PE61102F, WIAFOSR2308A3.

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CENTRAL INST FOR THE DEAF ST LOUIS MO

DESCRIPTORS: (U) \*AUDITORY SIGNALS, \*MASKING, \*AUDITORY PERCEPTION, DETECTION, FREQUENCY, FREQUENCY BANDS, HEARING, INTERNAL, NOISE, OVERLAP, PATTERNS, PROCESSING EQUIPMENT, SIGNAL PROCESSING, STIMULI, TIME DOMAIN, YIELD, DISCRIMINATION, MATHEMATICAL MODELS, BACKGROUND NOISE.

(U) Binaural Masking: An Analysis of Models.

DESCRIPTIVE NOTE: Annual rept. 15 Jul 88-14 Mar 88,

APR 88 20P

IDENTIFIERS: (U) PE01102F, WJAFOSR2313A6.

PERSONAL AUTHORS: Gilkey, Robert H.

CONTRACT NO. AFOSR-88-0298

PROJECT NO. 2313

TASK NO. A8

MONITOR: AFOSR  
TR-88-0880

UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of this project is to specify the transformations used by the auditory system in order to determine the presence of the signal in an auditory masking task, with particular emphasis on the role of processes that compare information in the frequency domain and in the time domain. Classical models that restrict analysis to a single frequency band and a single temporal window are evaluated. In addition, the role of pattern or 'profile' analysis in auditory processing is being assessed by fitting more complex models to the data. The results show that similar cues determine performance in monaural and binaural masking tasks. Information remote from the signal in frequency can be used to overcome the effects of uncertainty about the stimulus level. Masking noise which does not overlap with the signal in time can either improve or degrade the detectability of the signal, depending upon the interaural phase relations of the masker and the signal. The analyses yield a quantitative description of processes that compare information within the frequency band and temporal window that contain the signal to information in other spectral/temporal regions. Other significant results include a more complete description of internal noise processes and evidence that the external masker is not cancelled by the binaural processor.

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AD-A195 502 12/8

AD-A195 501 21/2

COLORADO UNIV AT BOULDER DEPT OF COMPUTER SCIENCE

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING(U) Concurrent Algorithms for Numerical Computation on  
Hypercube Computer.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 87,

FEB 88 3P

PERSONAL AUTHORS: Schnabel, R.

CONTRACT NO. AFOSR-87-0056

PROJECT NO. 2304

TASK NO. A8

MONITOR: AFOSR  
TR-88-0587

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this grant was to purchase a hypercube computer to support DoD-sponsored research, and other research, in parallel numerical computation. The plans that were outlined in the proposal were followed very closely. We have purchased a 32-node Intel IPSC-D5 hypercube computer with the funds from this grant, and have used the matching University contribution to support the maintenance of this computer. This computer has been used, over the past year, for research in parallel numerical computation in areas including global optimization, VLSI design, large sparse systems of linear equations, and eigenvalue problems, as well as for research in the languages for parallel computation and in the debugging and measurement of parallel programs.

DESCRIPTORS: (U) \*PARALLEL PROCESSORS, \*SUPERCONDUCTORS, COMPUTATIONS, DEPARTMENT OF DEFENSE, EIGENVALUES, GLOBAL, LINEAR ALGEBRAIC EQUATIONS, MEASUREMENT, NUMERICAL METHODS AND PROCEDURES, OPTIMIZATION.

IDENTIFIERS: (U) Hypercube computers, PEG1102F,  
WJAFOSR2304A8.

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(U) Fuel Structure and Pressure Effects on the Formation  
of Soot Particles in Diffusion Flames.

DESCRIPTIVE NOTE: Annual rept. 15 Jan 87-14 Jan 88,

FEB 88 33P

PERSONAL AUTHORS: Santoro, Robert J.

CONTRACT NO. AFOSR-87-0045

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-88-0684

UNCLASSIFIED REPORT

ABSTRACT: (U) During the first year of the present grant, efforts have concentrated on examining the effects of fuel molecular structure on soot formation in diffusion flames. Studies involving alkane, alkene, alkyne and aromatic fuel species have been studied with specific attention given to the surface growth process. Analysis of these studies has demonstrated a strong fuel structure dependence for the amount of soot formed, the conversion percentage of fuel carbon to soot, and the soot particle surface area present in these diffusion flames. However, when surface area taken into account, similar specific surface growth rate coefficients are observed for all the fuels studied. These results point to a similar surface growth process for all the fuels. Consistent with premixed flame results, the present studies show a continual decrease in this specific surface growth rate coefficient with time. Other effects of fuel structure observed include an acceleration of the inception of soot particles to lower locations and, thus, earlier times in the flame as soot conversion percentage increases. These results also point to the importance of the initial particle inception process which appears to control subsequent soot particle evolution. Keywords: Soot formation; Soot particles; Diffusion flames.

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DESCRIPTORS: (U) \*FLAMES, \*FUELS, \*MOLECULAR STRUCTURE,  
\*SOOT, ACCELERATION, ALKENES, ALKYNES, AROMATIC COMPOUNDS,  
CARBON, CONVERSION, DIFFUSION, EVOLUTION(GENERAL),  
GROWTH(GENERAL), MIXING, PARTICLES, PRESSURE, SURFACES.

CALIFORNIA UNIV LOS ANGELES

(U) Theory of Filtering and Control with Application to  
Control of Large Space Structures.

IDENTIFIERS: (U) Diffusion flames, PE81102F,  
WUASOSR2308A2.

DESCRIPTIVE NOTE: Final rept. 1 Sep 83-31 Aug 87,

MAR 88 8P

PERSONAL AUTHORS: Balakrishnan, A. V.

CONTRACT NO. AFOSR-83-0318

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0688

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes accomplishments under a grant to study modeling. Identification, and control of flexible structures and to study random fields with applications to laser beam distortion in a turbulent field. Research in flexible structures focused on deriving continuum models base upon partial differential equations and derived methods for the solution of the resulting boundary control problems. A robust controller for stabilization based upon the abstract Hilbert-space semigroup formulation was derived as was a stochastic control theory for partial differential equations. A white noise theory for random fields was derived which has applications to laser beam propagation in the atmosphere; in particular, it is used to model the turbulent field.

DESCRIPTORS: (U) \*DISTORTION, \*FLEXIBLE STRUCTURES,  
\*SPACECRAFT, \*DYNAMIC LOADS, BOUNDARY VALUE PROBLEMS,  
CONTROL, CONTROL THEORY, FILTERS, LASER BEAMS, LIGHT  
TRANSMISSION, MODELS, PARTIAL DIFFERENTIAL EQUATIONS,  
STOCHASTIC CONTROL, THEORY, TURBULENCE, WHITE NOISE,  
CONTINUUM MECHANICS, HILBERT SPACE.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1.

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## DYIC REPORT BIBLIOGRAPHY

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RENSELAER POLYTECHNIC INST TROY NY

(U) Support of International Symposium on Halide Glasses (4th) Held in Monterey, California on 26-29 January 1987.

DESCRIPTIVE NOTE: Final rept. 20 Jan-20 Jul 87,

APR 88

30P

PERSONAL AUTHORS: Moynihan, Cornelius Y.

CONTRACT NO. AFOSR-87-0141

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR

TR-88-0865

## UNCLASSIFIED REPORT

ABSTRACT: (U) A brief report is given on the 4th International Symposium on Halide Glasses held in Monterey, CA, Jan. 26-29, 1987. Included is a list of papers published in the Symposium proceedings on optical, thermal and mechanical properties of halide glasses, on methods of preparation of these materials and on their potential applications. Keywords: Fluoride glass, Halide glass.

DESCRIPTORS: (U) \*GLASS, FLUORIDES, HALIDES, INTERNATIONAL, MECHANICAL PROPERTIES, SYMPOSIA, OPTICAL PROPERTIES, THERMAL PROPERTIES.

IDENTIFIERS: (U) Fluoride glass, Halide glasses, PE81102F, WIAFOSR2303A3.

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CORNELL UNIV ITHACA NY LAB OF ATOMIC AND SOLID STATE PHYSICS

(U) Physics and Technology for the In-Situ Investigation of Properties of Materials.

DESCRIPTIVE NOTE: Annual rept. 15 Jan 87-14 Jan 88,

MAY 88

9P

PERSONAL AUTHORS: Parpia, J. W.; Richardson, R. C.

CONTRACT NO. AFOSR-87-0148

PROJECT NO. 2308

TASK NO. C1

MONITOR: AFOSR

TR-88-0811

## UNCLASSIFIED REPORT

ABSTRACT: (U) The progress report is broken up into four sections, the first detailing the apparatus constructed, the second, results on  $\text{CoSi}_2$ , and third, very recent results on free standing Aluminum films and wires. In addition, results on Arsenic doped Silicon are proceeding and are described briefly. Samples can be inserted into our Oxford 200 top loading dilution refrigerator cryostat which has been modified to include a 7T magnet mounted on the mixing chamber. We also have a small independently operated solenoid which is used to ramp the magnetic field slowly, and to provide a zero field environment, by nulling out trapped fields in the main solenoid. This apparatus allows us to carry out transport measurements down below 20 mK (5 mK in zero field), provided that the sample holders are properly heat sunk. We have carried out measurements on several samples of Cobalt Silicate ( $\text{CoSi}_2$ ). The first was on a 170 Angstrom thick layer where we observed that the material had a resistance ratio of approximately 5.5, with a superconducting transition at approximately 1K (mid point 0.75K). (see figure 1a), and a critical field of approximately 100 G. In this sample, we have observed a shallow minimum in resistance at 4.5 K (figure 1b) with a log T low temperature resistance in the normal state.

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DESCRIPTORS: (U) \*ALUMINUM, \*ARSENIC, \*COBALT, \*RESISTANCE, \*SILICATES, CHAMBERS, CRYOSTATS, DILUTION, FILMS, MAGNETIC FIELDS, MIXING, PHYSICS, RAMPS, RATIONS, REFRIGERATION SYSTEMS, SAMPLING, SOLENOIDS, SUPERCONDUCTIVITY, TRANSITION TEMPERATURE, TRAPPING(CHARGED PARTICLES).

CALIFORNIA UNIV IRVINE DEPT OF ELECTRICAL ENGINEERING  
(U) Statistical Analysis of the LMS (Last Mean Squares) and Modified Stochastic Gradient.

DESCRIPTIVE NOTE: Final rept. 15 Mar 87-14 Apr 88.

IDENTIFIERS: (U) PE81102F, WUAFOSR2308C1.

APR 88 6P

PERSONAL AUTHORS: Bershad,

CONTRACT NO. AFOSR-88-0093

PROJECT NO. 2304

TASK NO. A6

MONITOR: AFOSR  
TR-88-0588

UNCLASSIFIED REPORT

ABSTRACT: (U) Research on the stochastic behavior of the last mean squares (LMS) and related algorithms has yielded results in four majors. Significant progress has been made in determining the joint transient and steady state probability density functions of the time domain LMS weights for gaussian jammers. The effects of non-linearities on the time domain LMS algorithm have been analyzed. Keywords: Transient behavior of arbitrary linear filters; Joint probability density functions; Weighting functions; Spread spectrum communications; Adaptive filtering.

DESCRIPTORS: (U) \*STATISTICAL ANALYSIS, \*ELECTRICAL ENGINEERING, ADAPTIVE FILTERS, ALGORITHMS, COMMUNICATION AND RADIO SYSTEMS, GRADIENTS, LINEAR FILTERING, PROBABILITY DENSITY FUNCTIONS, SPREAD SPECTRUM, STOCHASTIC PROCESSES, TIME DOMAIN, TRANSIENTS, WEIGHTING FUNCTIONS, APPLIED MATHEMATICS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304AG.

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EYE RESEARCH INST OF RETINA FOUNDATION BOSTON MA

IDENTIFIERS: (U) \*Spatial pattern vision, PE8102F,  
WUAFOSR2313A5.

(U) Eye Movements and Spatial Pattern Vision.

DESCRIPTIVE NOTE: Annual Rept. 1 Mar 87-29 Feb 88.

MAR 88 19P

PERSONAL AUTHORS: Arend, Lawrence E.

CONTRACT NO. AFOSR-88-0128

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
YR-88-0547

UNCLASSIFIED REPORT

**ABSTRACT:** (U) Models of lightness and color perception must take account of human color constancy, a tendency for apparent surface color to be relatively independent of the color and intensity of the illuminating light source. Observers matched the lightnesses and brightnesses of regions in simple and complex achromatic spatial patterns. The data showed that the observers' knowledge of the surface reflectances (revealed by lightness matches) was unaffected by changing brightness of the same surfaces (revealed by brightness matches). In the analogous chromatic experiments, observers matched the hue and saturation of patches or the patches' apparent surface colors. The observers' knowledge of the surface colors was not as reliable as in the achromatic case. Patches' hues and saturations matched when their chromaticities were approximately the same. Shifts of hue attributable to simultaneous color contrast were in the correct direction but too small to produce hue constancy. Keywords: Spatial pattern vision; Visual illusions; Color constancy; Color vision.

**DESCRIPTORS:** (U) \*COLOR VISION, \*EYE MOVEMENTS, \*PATTERN RECOGNITION, CHROMATICITY, COLORS, CONTRAST, HUMANS, ILLUMINATION, ILLUSIONS, LIGHT SOURCES, OPTICAL IMAGES, PATTERNS, REFLECTANCE, SATURATION, SPATIAL DISTRIBUTION, SURFACES, SYNCHRONISM, VISION.

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DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV148A

AD-A195 489 11/8.1

AD-A195 480 20/8 12/8

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF MATERIALS  
SCIENCE AND ENGINEERING

CALIFORNIA UNIV SAN DIEGO LA JOLLA

(U) A Study of the Fatigue Behavior of Small Cracks in  
Nickel-Base Superalloys.(U) Architecture Studies and System Demonstrations of  
Optical Parallel Processor for AI(Artificial  
Intelligence) and NI(Neural Intelligence).

DESCRIPTIVE NOTE: Final rept. 1 Jan 84-1 Aug 87.

DESCRIPTIVE NOTE: Semi-annual rept. 1 Oct 87-31 Mar 88.

FEB 88 153P

MAR 88

PERSONAL AUTHORS: Pelloux, Regis M.; Feng, Jun; Romanoski,  
Glenn

PERSONAL AUTHORS: Lee, Sing H.

CONTRACT NO. AFOSR-84-0075

CONTRACT NO. AFOSR-88-0022

PROJECT NO. 2308

PROJECT NO. 6150

TASK NO. A1

TASK NO. 00

MONITOR: AFOSR  
TR-88-0457MONITOR: AFOSR  
TR-88-0578

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The fatigue of behavior of short cracks was investigated in five wrought nickel-base superalloys currently used for aircraft turbine disks. Cracks were initiated at artificial defects and at persistent slip bands. Test frequencies ranged from 20Hz to 100pm. Fatigue crack growth rates were measured over crack lengths ranging from 10  $\mu$ m to 1mm. Most of the testing was performed in load control with stress ranges approaching the cyclic yield strengths of alloys. Strain controlled tests were performed on IN100 under elastic-plastic cycling conditions. Keywords: Crack propagation; Physical metallurgy.

ABSTRACT: (U) In solving deterministic AI problems the data search for matching the arguments of a PROLOG expression causes serious bottleneck when implemented sequentially by electronic systems. To overcome this bottleneck we have developed the concepts for an optical expert system based on matrix-algebraic formulation, which will be suitable for parallel optical implementation. The optical AI system based on matrix-algebraic formation will offer distinct advantages for parallel search, adult learning, etc.

DESCRIPTORS: (U) \*CRACK PROPAGATION, \*NICKEL ALLOYS, \*SUPERALLOYS, \*FATIGUE TESTS(MECHANICS), AIRCRAFT, CRACKS, CYCLES, DEFECTS(MATERIALS), ELASTIC PROPERTIES, FATIGUE(MECHANICS), FREQUENCY, LOAD CONTROL, PHYSICAL METALLURGY, PLASTIC PROPERTIES, RATES, STRESS ANALYSIS, TEST AND EVALUATION, TURBINE COMPONENTS, WROUGHT METALS, YIELD STRENGTH.

DESCRIPTORS: (U) \*ARCHITECTURE, \*LEARNING, \*OPTICAL EQUIPMENT, \*SEARCHING, ADULTS, DEMONSTRATIONS, ELECTRONIC EQUIPMENT, INFORMATION RETRIEVAL, OPTICAL PROCESSING, PARALLEL ORIENTATION, PARALLEL PROCESSORS.

IDENTIFIERS: (U) Inconel 718 alloy, Inconel X-750 alloy, Rene 95 alloy, Waspaloy, PE81102F, WUAFOSR2308A1.

IDENTIFIERS: (U) WUAFOSR815000, PE81102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 479 20/12

AD-A195 479 CONTINUED

COLORADO STATE UNIV FORTY COLLINS

(U) Beam Assisted Fabrication of III-V/Si Monolithic Devices.

ORGANOMETALLIC COMPOUNDS, FILMS, FABRICATION, CONFINEMENT(GENERAL), PLASMAS(PHYSICS), DISKS, SHAPE, EXCIMER, LASERS, CHEMICAL REACTIONS, ORGANOMETALLIC COMPOUNDS, VAPOR DEPOSITION, THIN FILMS, SUBSTRATES, VACUUM ULTRAVIOLET RADIATION, PHOTONS.

DESCRIPTIVE NOTE: Semi-annual rept. 1 Oct 87-31 Mar 88.

IDENTIFIERS: (U) PE81102F, WJAFDSR9584800.  
\*Semiconducting films, Silicon, Molecular beam epitaxy, Chemical vapor deposition, Hydrogen plasma, Excimer lasers.

MAR 88

PERSONAL AUTHORS: Robinson, Gary Y.

CONTRACT NO. F49620-88-K-0021

PROJECT NO. 5548

TASK NO. 00

MONITOR: AFOSR  
YR-88-0577

UNCLASSIFIED REPORT

ABSTRACT: (U) This research project is to explore two new methods for deposition of III-V semiconducting films on Si substrates. Using gas-source molecular beam epitaxy (MBE) and photo-beam and electron-beam assisted metal-organic chemical vapor deposition (MOCVD), GaAs and other III-V films with abrupt heterojunctions are being formed epitaxially on Si, and by means of optical and electrical characterization the suitability of the resulting III-V/Si structures are being examined for use monolithic devices. A well-confined hydrogen plasma of disk shape is employed both as a vacuum ultraviolet (VUV) lamp operating primarily at 121.5 nm and as a source of atomic hydrogen radicals. Both VUV photons and atomic hydrogen act to dissociate feedstock gases used in low-temperature (< 400 C) metalorganic chemical vapor deposition (MOCVD). Thin films have been deposited both with the confined hydrogen plasma and with an excimer laser operating at 193 nm in order to compare the two methods. Preliminary chemical and electrical properties of the films deposited via the two methods indicate the superiority of the atomic hydrogen assisted MOCVD technique.

DESCRIPTORS: (U) \*GROUP III COMPOUNDS, \*GROUP V COMPOUNDS, ALUMINUM COMPOUNDS, NITRIDES, ATOMIC STRUCTURE, CHEMICAL RADICALS, HYDROGEN, CHEMICAL PROPERTIES, ELECTRICAL PROPERTIES, DEPOSITION, ELECTRON BEAMS,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 477 20/6 12/6

RUTGERS - THE STATE UNIV NEW BRUNSWICK NJ LAB FOR  
COMPUTER SCIENCE RESEARCH

(U) Architecture for Optical Digital Computers.

DESCRIPTIVE NOTE: Annual rept.,

AUG 87 18P

PERSONAL AUTHORS: Levy, Saul Y.; Hall, J. S.; Murdocca,  
Miles J.

CONTRACT NO. AFOSR-88-0294

PROJECT NO. 2305

TASK NO. B1

MONITOR: AFOSR  
TR-88-0531

UNCLASSIFIED REPORT

ABSTRACT: (U) We are investigating a Content Addressable Memory architecture for a digital optical computer. This investigation is being funded by AFOSR, and is being carried out in conjunction with work on digital optical computing devices at Bell Laboratories in Holmdel, NJ. Because of the massive parallelism inherent in the CAM organization it is ideal candidate to constructed of the types of optical components being investigated at the Labs.

DESCRIPTORS: (U) \*DIGITAL COMPUTERS, \*OPTICAL EQUIPMENT, \*OPTICAL PROCESSING, COMPUTATIONS, COMPUTERS, ORGANIZATIONS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2303B1.

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AD-A195 464 20/12 9/5

ILLINOIS UNIV AT URBANA COORDINATED SCIENCE LAB

(U) III-V Heterojunction Structures and High Speed Devices.

DESCRIPTIVE NOTE: Annual progress rept. 1 Feb 87-31 Jan 88.

MAR 88 41P

PERSONAL AUTHORS: Morkoc, Hadis

CONTRACT NO. AFOSR-88-0111

PROJECT NO. 2304

TASK NO. C1

MONITOR: AFOSR  
TR-88-0530

UNCLASSIFIED REPORT

ABSTRACT: (U) A systematic investigation of the InGaAs/AlO<sub>1.5</sub>As pseudomorphic MODFET has revealed an optimum InAs mole fraction of 0.15 <  $x$  < 0.20. Meanwhile, continuing studies of the InGaAs/GaAs strained layer MQW by optical transmission and photoreflectance have displayed sharp spectral features, revealing the excellent optical quality of the samples. With good agreement between the measured spectra and our band structure model, an increased understanding of the InGaAs MQW structures into p-i-n optical modulators, large 27% changes in transmission have been reported. Operating this MQW electroabsorption optical modulator as a Self-Electrooptic Effect Device, we have reported the first demonstration of this device in the InGaAs material system. Keywords: Indium compounds, Gallium arsenides.

DESCRIPTORS: (U) \*GALLIUM ARSENIDES, \*GROUP III COMPOUNDS, \*GROUP V COMPOUNDS, \*LIGHT MODULATORS, \*PIN DIODES, ABSORPTION, DEMONSTRATIONS, HETEROJUNCTIONS, INDIUM COMPOUNDS, LIGHT TRANSMISSION, OPTICAL PROPERTIES, STRUCTURES.

IDENTIFIERS: (U) PE81102F, WJAFOSR2305C1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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CRYSTALLUME MENLO PARK CA

(U) PECVD (Plasma Enhanced Chemical Vapor Deposition)  
Diamond Thin Films for Research Instrumentation.

IDENTIFIERS: (U) PE81102F, WJAFOSR3005A1.

DESCRIPTIVE NOTE: Final rept. 9 Jan 87-30 Apr 88.

88 37P

PERSONAL AUTHORS: Peters, M. G.; Pinneo, J. M.; Ravi, K.  
V.; Plano, L. S.

CONTRACT NO. F49620-87-C-0102

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-88-0847

UNCLASSIFIED REPORT

ABSTRACT: (U) Natural diamond exhibits several properties that indicate its utility as a semiconducting material. It is environmentally robust and an excellent thermal conductor, characteristics which would allow it to operate under temperature and radiation conditions that would render useless more commonly used semiconductors such as silicon and GaAs. In addition, it has optical properties that suggest it use as a short wavelength turnable laser. Several materials issues have prevented the development of diamond as a semi-conductor in device, laser and related applications. Natural diamond is expensive to obtain in useful sizes. The impurity and defect levels can vary dramatically from one sample to the next, making potential product reproducibility difficult to achieve. It is unavailable in thin film form. High pressure synthetic diamond is also unsuitable for the foregoing applications because of impurities and inability to produce thin films.

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*DIAMONDS, \*THIN FILMS, \*VAPOR DEPOSITION, HIGH PRESSURE, IMPURITIES, INSTRUMENTATION, LASERS, MATERIALS, NATURAL RESOURCES, OPTICAL PROPERTIES, RADIATION, REPRODUCIBILITY, SEMICONDUCTORS, SHORT WAVELENGTHS, SILICON, SYNTHETIC STONES.

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AD-A195 441 12/3

AD-A195 440 20/4 21/5

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

TENNESSEE UNIV SPACE INST TULLAHOMA

(U) Estimation With Truncated Data.

(U) Contamination and Distortion of Steady Flow Field Induced by Discrete Frequency Disturbances in Aircraft Gas Engines.

DESCRIPTIVE NOTE: Final rept.,

DESCRIPTIVE NOTE: Final rept. Jan-Dec 87,

PERSONAL AUTHORS: Blumenthal, Saul; Goel, Prem K.

APR 88 5P

CONTRACT NO. ASFOSR-84-0182

PERSONAL AUTHORS: Kurosaka, M.

PROJECT NO. 2304

CONTRACT NO. AFOSR-83-0049

TASK NO. K3

PROJECT NO. 2307

MONITOR: AFOSR  
TR-88-0838

MONITOR: AFOSR  
TR-88-0840

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The following research papers and reports were produced under AFOSR-84-0182. Asymptotic Expansions for Modified Maximum Likelihood Estimators with Percentile Truncated Data; Population or Sample Size Estimation; Estimating N with Time Grouped, and Truncated Data from a Scale Parameter Distribution; Estimation with Grouped, and Truncated Data; Estimating N with Percentile Grouped, and Truncated Data from a Scale Parameter Distribution; Burn-in with Mixed Populations; Reliability Demonstration for New Series Systems; A New Approximation for the Reliability of New Series Systems.

DESCRIPTORS: (U) \*TRUNCATION, \*ESTIMATES, \*STATISTICAL DATA, ASYMPTOTIC SERIES, DEMONSTRATIONS, DISTRIBUTION, MIXING, PARAMETERS, POPULATION, RELIABILITY, SCALE, MAXIMUM LIKELIHOOD ESTIMATION.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304K3.

ABSTRACT: (U) The main objective of this program was to acquire fundamental understanding of two aerodynamic effects induced by vortices shed by blades of aircraft gas turbines: a) the instantaneous separation of total temperature and pressure around vortices in the wake shed and its time averaged effect; and b) the issue of over 100% efficiency measured near the hub section of an advanced turbofan design of the Air Force Aeropropulsion Laboratory. Through the combination of experimental and theoretical investigations, the mechanisms of the two phenomena have been identified. Keywords: Vortex shedding; Turbofan engines; Unsteady flow; Negative entropy.

DESCRIPTORS: (U) \*VORTEX SHEDDING, \*WAKE, \*GAS TURBINE BLADES, AERODYNAMIC FORCES, AIRCRAFT ENGINES, CONTAMINATION, DISTORTION, FLOW FIELDS, FREQUENCY, GAS TURBINES, HUBS, LABORATORIES, SEPARATION, STEADY FLOW, THEORY, TURBOFAN ENGINES, UNSTEADY FLOW, VORTICES, EFFICIENCY, ENTROPY.

IDENTIFIERS: (U) Negative entropy, PE81102F, WUAFOSR2307A4.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A195 405 11/4 11/2

HARRIS CORP MELBOURNE FL GOVERNMENT AEROSPACE SYSTEMS  
DIV

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Sequential Design of Decentralized Dynamic  
Compensators Using the Optimal Projection Equations.

(U) A Study of the Critical Factors Controlling the  
Synthesis of Ceramic Matrix Composites from Preceramic  
Polymers.

87 10P

DESCRIPTIVE NOTE: Semi-Annual rept.,

PERSONAL AUTHORS: Bernstein, Dennis S.

APR 88 5P

CONTRACT NO. F49620-88-C-0002, F49620-88-C-0038

PERSONAL AUTHORS: Strife, J. R.; Brunette, C. M.; Pike, R.  
A.; Streckert, H. H.; Sheehan, J. E.

PROJECT NO. 2304

CONTRACT NO. F49620-87-C-0083, SDARPA Order-8153

TASK NO. A1

PROJECT NO. 8153

MONITOR: AFOSR  
TR-88-0533

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-88-0528

SUPPLEMENTARY NOTE: Pub. in International Jnl. of Control,  
v46 n5 p1569-1577 1987.

UNCLASSIFIED REPORT

ABSTRACT: (U) The optimal projection equations for quadratically optimal centralized fixed-order dynamic compensation are generalized to the case in which the dynamic compensator has, in addition, a fixed decentralized structure. Under a stabilizability assumption for the particular feedback configuration, the resulting optimality conditions explicitly characterize each subcontroller in terms of the plant and remaining subcontrollers. This characterization associates an oblique projection with each subcontroller and suggests an iterative sequential design algorithm. The results are applied to an interconnected flexible beam example. (Reprints)

DESCRIPTORS: (U) \*COMPENSATORS, \*CONTROL SYSTEMS, ALGORITHMS, CONFIGURATIONS, DECENTRALIZATION, DYNAMICS, EQUATIONS, FEEDBACK, ITERATIONS, OPTIMIZATION, REPRINTS, SEQUENCES, CONNECTORS, CLOSED LOOP SYSTEMS, TRANSFER FUNCTIONS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A1.

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ABSTRACT: (U) Several DoD technology thrusts such as the Integrated High Performance Integrated Turbine Engine Technology Program and the National Aerospace Plane depend on the development of high temperature low density materials. The development of fiber reinforced ceramics is projected to play a major role in this endeavor because of their high temperature capacity and superior mechanical properties on a density normalized basis at elevated temperature. Fiber reinforced ceramics have been processed to date primarily by hot pressing tape materials or by the chemical vapor infiltration of fibrous preforms.

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*MATRIX MATERIALS, \*FIBER REINFORCED COMPOSITES, AEROSPACEPLANES, COMPOSITE MATERIALS, FIBER REINFORCEMENT, HIGH TEMPERATURE, HOT PRESSING, INFILTRATION(FLUIDS), MECHANICAL PROPERTIES, POLYMERS, SYNTHESIS, TAPES, VAPORS.

IDENTIFIERS: (U) WJAFOSR815300, PE81102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A195 344 17/9 4/1 4/2 AD-A195 344 CONTINUED

CONTROL DATA CORP MINNEAPOLIS MN METEOROLOGY RESEARCH CENTER

(U) Measurement of Vertical Velocity Using Clear-Air Doppler Radars.

MAR 88

PERSONAL AUTHORS: VanZandt, T. E.; Green, J. L.; Nastrom, G. D.; Gage, K. S.; Clark, W. L.

CONTRACT NO. F49620-86-C-0027

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-88-0495

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at the Symposium on Lower Tropospheric Profiling: Needs and Technologies Held in Boulder, Colorado on May 31-June 3, 1988.

ABSTRACT: (U) Since the development of the clear-air Doppler radar technique (also called the Wind-profiling or MST-radar technique) at Jicamarca, Peru (Woodman and Guillen, 1974), it has been applied to a wide range of meteorological problems (see, e.g., Liu and Kato, 1985). Despite this rapid progress, research on some important problems has been frustrated by the fact that most clear-air Doppler radars are near mountains. The resulting orographic effects act as geophysical noise on observations of other processes. These effects are especially serious for studies of the vertical component of motion. For example, Ecklund et al. (1982) found that when the wind flowed over the mountains, the variance of the vertical velocity was strongly correlated with the wind speed. Nastrom et al. (1985) found that they could extract the small synoptic-scale vertical velocity only when the horizontal wind was not from the direction of nearby mountains. Following their suggestion, we have constructed a new clear-air Doppler radar, called the Flatland radar, in very flat terrain near Champaign-Urbana, Illinois. We find that the vertical velocity field over very flat terrain is indeed quite different

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from that near rough terrain, and we present observations that suggest that the vertical velocity due to other processes, such as synoptic-scale motions and gravity waves, can be studied by clear-air Doppler radars in very flat terrain.

DESCRIPTORS: (U) \*CLEAR AIR TURBULENCE, \*DOPPLER RADAR, \*GRAVITY WAVES, \*MOUNTAINS, \*WIND, GEOPHYSICS, HORIZONTAL ORIENTATION, ILLINOIS, MEASUREMENT, METEOROLOGY, MOTION, NOISE, PERU, RANGE(EXTREMES), ROUGHNESS, TERRAIN, VELOCITY, VERTICAL ORIENTATION, WIND VELOCITY.

IDENTIFIERS: (U) MJAFOSK2310A1, PE51102F

## UNCLASSIFIED

## DYIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI46A

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## OPTICAL SOCIETY OF AMERICA WASHINGTON D C

CALIFORNIA UNIV LOS ANGELES DEPT OF MATERIALS SCIENCE  
AND ENGINEERING

- (U) Topical Meeting on Photonic Switching Held in Incline Village, Nevada on 18-20 March 1987. Technical Digest Series. Volume 13.

DESCRIPTIVE NOTE: Final rept. 15 Mar 87-31 Mar 88,

MAR 88 86P

PERSONAL AUTHORS: Quinn, J. W.

CONTRACT NO. AFOSR-87-0207

PROJECT NO. 2305

TASK NO. B2

MONITOR: AFOSR  
TR-88-0521

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Postdeadline papers included.

ABSTRACT: (U) This meeting provided a forum for the presentation of both invited and contributed original papers on the subjects of devices and architectures suitable for switching, multiplexing, or routing optical signals. This meeting fostered and enhanced interaction between two groups that share a common interest in exploring possible applications of photonics switching technology; people working on optical switching devices and components; and people working on future switching systems and networks. Papers covered the following areas: devices and phenomena for switching applications and switching systems and network architectures utilizing optical switching technologies.

DESCRIPTORS: (U) \*OPTICAL EQUIPMENT, \*OPTICAL SWITCHING, ARCHITECTURE, MULTIPLEXING, NETWORKS, OPTICS, PHOTONS, SIGNALS, SWITCHING.

IDENTIFIERS: (U) WJAFOSR2305B2, PE61102F.

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- (U) International Conference on Ultrastructure Processing of Ceramics, Glasses and Composites (3rd) Held in San Diego, California on February 23-27, 1988.

DESCRIPTIVE NOTE: Final technical rept. 1 Jan-31 Dec 87,

APR 88 14P

PERSONAL AUTHORS: Mackenzie, John D.

CONTRACT NO. AFOSR-87-0085

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-88-0676

## UNCLASSIFIED REPORT

ABSTRACT: (U) During the past decade, interests in the processing of ceramics have been shifting from the micron-scale to the submicron scale of powders. Simultaneously there has been a growing interest in the sol-gel process to produce glasses. In addition, the use of metal-organic compounds as precursors has been successful in the preparation of silicon carbide fibers. The objectives for this Third Conference was similar to those of the two previous ones, namely to establish and to strengthen the scientific foundation for a new era in the processing of ceramics, glasses and composites for electronic, optical, structural and novel applications. In the past few years, attempts to understand and to control the processing of these materials on a submicron and even molecular scale through direct interactions between chemists, materials scientists, engineers and physicists, made possible by the support of AFOSR and others, have already led to new materials, novel processes and improved properties.

DESCRIPTORS: (U) \*CERAMIC MATERIALS, \*FIBERS, \*SILICON CARBIDES, INTERACTIONS, ORGANOMETALLIC COMPOUNDS, PHYSICISTS, PROCESSING, SCIENTISTS, SYMPOSIA, ALUMINUM, SILICON, CARBORANES, TITANIUM, BORON NITRIDES, OPTICAL PROPERTIES.

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MASSACHUSETTS INST OF TECH CAMBRIDGE

IDENTIFIERS: (U) Sol gels, PE61102F, WUAFOSR2303A3,  
Micromolecules.

(U) Synthesis and Study of Materials for Superconducting  
Electronics.

DESCRIPTIVE NOTE: Final rept. 1 Oct 84-30 Sep 87.

MAR 88 16P

PERSONAL AUTHORS: Tedrow, P. M.; Meservey, R.; Orlando, T.  
P.

CONTRACT NO. F49620-85-C-0005

PROJECT NO. 2308

TASK NO. C1

MONITOR: AFOSR  
TR-88-0453

UNCLASSIFIED REPORT

ABSTRACT: (U) Study of high-Tc superconductors in single-crystal and thin film form has begun. Investigation of semiconductor tunnel barriers has led to improvement of their theoretical description. Transport measurements of layered films of transition metal nitrides showed evidence of spin-orbit scattering and dimensional crossover effects. A technique for analyzing tunneling conductances to obtain the amount of Zeeman splitting using Fourier transforms has been developed and applied to V3Ga tunneling data. Spin-orbit scattering rates measured by two independent techniques, spin-polarized tunneling and magnetoresistance, have been shown to be similar. The strength of Ferri-liquid corrections on the effective magnetic moment of conduction electrons in vanadium and gallium has been found using spin-polarized tunneling. The effect of spin-orbit scattering on the density of states of superconducting thin films has been measured. The superconducting properties of ultra-thin niobium films were studied.

DESCRIPTORS: (U) \*SUPERCONDUCTORS, \*THIN FILMS, \*TUNNELS, \*SINGLE CRYSTALS, BARRIERS, CONDUCTIVITY, ELECTRICAL CONDUCTIVITY, ELECTRONICS, ELECTRONS, FILMS, FOURIER TRANSFORMATION, GALLIUM, LAYERS, MAGNETIC MOMENTS, MAGNETORESISTANCE, MATERIALS, MEASUREMENT, NIOBIUM,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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NITRIDES, ORBITS, RATES, SCATTERING, SEMICONDUCTORS, SPINNING(MOTION), SPLITTING, SUPERCONDUCTIVITY, SYNTHESIS, TRANSITION METALS, TRANSPORT, TUNNELING, VANADIUM, ZEEMAN EFFECT, TRANSPORT PROPERTIES, TUNNELING(ELECTRONICS), JUNCTIONS, YTTRIUM OXIDES, BARIUM OXIDES, COPPER COMPOUNDS.

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) The ART of Adaptive Pattern Recognition by a Self-Organizing Neural Network. Revision.

DEC 87 28P

IDENTIFIERS: (U) Spin orbit coupling, Zeeman splitting, Superconductor junctions, PE81102F, WUAFOSR2308C1.

PERSONAL AUTHORS: Grossberg, Stephen; Carpenter, Gail A.

CONTRACT NO. F49620-88-C-0037, F49620-87-C-0018

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-88-0430

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Revision of report dated Aug 87. Sponsored in part by Contracts DAA029-85-K-0095 and AFOSR-85-0148.

ABSTRACT: (U) Partial Contents: Attention and Expectation in Self-Organizing Learning and Recognition Systems; The Stability-Plasticity Dilemma and Adaptive Resonance Theory; Competitive Learning Models; Self-Stabilized Learning by an ART Architecture in an Arbitrary Input Environment; Attentional Priming and Prediction: Matching by the 2/3 Rule; Automatic Control of Hypothesis Testing by Attentional-Orienting Interactions; Learning to Recognize an Analog World; Invariant Visual Pattern Recognition; The Three R's: Recognition, Reinforcement, and Recall; Self-Stabilization of Speech Perception and Production Codes: New Light on Motor Theory; and Psychophysiological and Neurophysiological Predictions of ART.

DESCRIPTORS: (U) \*ADAPTIVE SYSTEMS, \*NEURAL NETS, \*PATTERN RECOGNITION, \*PSYCHOPHYSIOLOGY, ANALOG SYSTEMS, AUTOMATIC, CODING, CONTROL, ENVIRONMENTS, GLOBAL, HYPOTHESES, INPUT, INVARIANCE, LEARNING, LIGHT, MODELS, MOTORS, PREDICTIONS, PRODUCTION, RECOGNITION, RESONANCE, SELF ORGANIZING SYSTEMS, TEST AND EVALUATION, THEORY, VISUAL PERCEPTION, COGNITION, ARCHITECTURE, NEUROPHYSIOLOGY, SPEECH.

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IDENTIFIERS: (U) PE81102F, WUAFOSR2304A7.

CONTROL DATA CORP MINNEAPOLIS MN METEOROLOGY RESEARCH CENTER

(U) Further Discussion of the Dynamical Processes That Contribute to the Spectrum of Mesoscale Atmospheric Motions.

MAR 88

PERSONAL AUTHORS: Gage, K. S.; Nastrom, G. D.

CONTRACT NO. F49620-88-C-0027

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-88-0442

UNCLASSIFIED REPORT

ABSTRACT: (U) In recent years much progress has been made in determining the spectrum of mesoscale atmospheric motions. The frequency spectra of vertical and horizontal velocities have been determined in the free atmosphere by means of the nearly continuous measurement of radial velocity by wind-profiling Doppler radar. In addition, wind measurements by commercial aircraft collected during the NASA Global Atmospheric Sampling Program (GASP) have been analyzed to yield wavenumber spectra in the upper troposphere and lower atmosphere that cover scales ranging from a few km to 10,000 km. This paper considered the dynamical processes that may be responsible for the observed mesoscale atmospheric wind spectra. The issue of whether the observed spectrum of horizontal velocity is due primarily to waves or turbulence by comparing the dependence of the observed horizontal velocity spectra on wind speed with the Doppler shifting effect anticipated for a model wave spectrum and for a model turbulence spectrum. The results show that the observed spectra do not follow either the turbulence model or the wave model very closely. However, the turbulence model seems to fit the observations more closely than does the wave model.

DESCRIPTORS: (U) \*ATMOSPHERIC MOTION, EARTH ATMOSPHERE, DOPPLER EFFECT, DYNAMICS, FREQUENCY, HORIZONTAL ORIENTATION, LOW ALTITUDE, MEASUREMENT, ATMOSPHERE MODELS.

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RADIAL VELOCITY, REPRINTS, SHIFTING, SPECTRA, TURBULENCE,  
VELOCITY, WAVES, WIND, WIND VELOCITY, DOPPLER RADAR,  
TROPOSPHERE, VERTICAL ORIENTATION.

SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT  
(U) Feasibility of Hot-Block Anemometry.

IDENTIFIERS: (U) PE81102F, WUAFOSR2310A1.

DESCRIPTIVE NOTE: Final rept. 1 Jul 87-31 Jan 88.

FEB 88 40P

PERSONAL AUTHORS: Thompson, Brian E.

REPORT NO. SRA-R88-910035-F

CONTRACT NO. F49620-87-C-0073

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-88-0475

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) Measurements of the instantaneous velocity vector are wanted in turbulent flows to determine the three components of mean velocity, the six components of the Reynolds stress tensor, and any higher order components required. It is desirable to obtain these velocity characteristics non-invasively, but a combination of the difficulty, complexity, cost and need for optical access and seeding, lead to hot-block anemometry as a complementary approach with different uncertainties and applications. The feasibility of developing hot-block anemometry to measure three-dimensional laminar and turbulent flows was investigated. The design of hot-block probes was addressed and the criteria for the measurement of turbulent flow, which include probe dimensions, power dissipation, probe materials, and sensor configurations, were obtained. Heat-transfer analysis, based partly on combined convection and conduction calculations of two-dimensional geometries, suggest that a three-dimensional probe concept based on hot-film pads is the configuration most likely to meet frequency response requirements for turbulent flows. Keywords: Anemometry, Velocimetry, Hot block, Hot film, Directionally sensitive, Thermal, Flow, Measurement.

DESCRIPTORS: (U) \*HEAT TRANSFER, \*TURBULENT FLOW,

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\*ANEMOMETERS, ACCESS, CONDUCTIVITY, CONFIGURATIONS, CONVECTION, COSTS, DETECTORS, DISSIPATION, FILMS, FREQUENCY RESPONSE, HIGH TEMPERATURE, MATERIALS, MEAN, MEASUREMENT, MOMENTUM TRANSFER, OPTICAL PROPERTIES, POWER, PROBES, REQUIREMENTS, STRESSES, TENSORS, THREE DIMENSIONAL, TWO DIMENSIONAL, VELOCITY, SHEAR STRESSES, THREE DIMENSIONAL FLOW.

TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER APPLICATIONS

(U) Influence of Laser Beam Geometry and Wavelength on Laser-Sustained Plasmas,

JUN 87 9P

IDENTIFIERS: (U) \*Hot block anemometers, Hot film anemometers, Reynolds stresses, PE61102F, WUAFOSR3005A1.

PERSONAL AUTHORS: Jeng, San-Mou; Keefer, Dennis

CONTRACT NO. AFOSR-83-0043

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0805

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in AIAA Fluid Dynamics, Plasma Dynamics and Laser Conference (19th), p1-7, 8-10 Jun 87.

ABSTRACT: (U) A first series of experiments has been performed for plasmas sustained with the TEM sub 00 beam from a carbon dioxide laser operated at a wavelength of 10.6 micrometers. Detailed temperature measurements were obtained for these plasmas which were used to calculate the power absorbed from the laser beam and the power emitted from the plasma as optically thin radiation. Detailed Fourier optical calculations were made for the laser intensity near focus for this beam and for an annular beam used in earlier experimental studies. Plasmas sustained with the  $f/17.3$  Gaussian beam and the  $f/5.6$  annular beam were found to be similar in spatial characteristics. The fractional power absorbed from the Gaussian beam was found to be smaller than for the annular beam, but the power utilized in heating the flow was larger. Numerical calculations were performed to compare plasmas sustained with wavelengths of 10.6, 3.9 and 2.2 micrometers. It was found that plasmas sustained with shorter wavelengths were longer in axial extent, and that they absorbed a smaller fraction of the incident beam power. Keywords: micrometers; Fourier; Gaussian; Wavelengths; Reprints.

DESCRIPTORS: (U) \*CARBON DIOXIDE LASERS, \*LASER BEAMS,

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## DTIC REPORT BIBLIOGRAPHY

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\*SPATIAL DISTRIBUTION, BEAMS(RADIATION), COMPUTATIONS, EXPERIMENTAL DATA, FOURIER ANALYSIS, GEOMETRY, MEASUREMENT, NUMERICAL ANALYSIS, OPTICAL PROPERTIES, POWER, REPRINTS, TEMPERATURE.

TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER APPLICATIONS

(U) Numerical Study of Laser-Sustained Hydrogen Plasmas in a Forced Convective Flow,

IDENTIFIERS: (U) PEB1102F, WUAFOSR2308A1.

JUN 87 10P

PERSONAL AUTHORS: Jeng, San-Mou; Keefer, Dennis R.

CONTRACT NO. AFOSR-83-0043

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0608

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Propulsion and Power, v3 n3 p255-262, 3 May-Jun 87. Presented at the AIAA/ASME/SAE/ASEE Joint Propulsion Conference, Huntsville, AL, 18-18 Jun 88.

ABSTRACT: (U) A two dimensional numerical model for laser sustained argon plasmas, which considers laminar Navier-Stokes equations and real ray tracing for the laser beam, has been extended for forced convective hydrogen plasmas. Realistic thermodynamic, transport, and optical properties of hydrogen were incorporated into the calculations. Parametric studies of inlet gas velocity, static pressure, laser power, and laser beam diameter have been conducted. Calculated plasma size, temperature distribution, flowfield, and energy conversion efficiency are presented in this paper. It was found that the constant axial mass flux (product of axial velocity and density) assumption which has been used in one-dimensional and quasi-two-dimensional models is not adequate for this problem. The results also revealed that plasma size, position, and radiation heat loss can be controlled by varying optical arrangements and operating conditions. Keywords: two dimensional, Laminar, Convective, Thermodynamics, Parametric, Flowfield, Quasi two dimensional.

DESCRIPTORS: (U) \*HYDROGEN, \*LASER BEAMS.

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\*PLASMAS(PHYSICS), ARGON, CONTROL, CONVECTION, DIAPHYERS, DISTRIBUTION, EFFICIENCY, ENERGY CONVERSION, FLOW, FLOW FIELDS, FLUX(RATE), GASES, HEAT LOSS, INLETS, LAMINAR FLOW, LASERS, MASS FLOW, MATHEMATICAL MODELS, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, OPTICAL PROPERTIES, PARAMETRIC ANALYSIS, POWER, RADIATION, RAY TRACING, SIZES(DIMENSIONS), STATIC PRESSURE, TEMPERATURE, TWO DIMENSIONAL, VELOCITY, REPRINTS.

TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER APPLICATIONS

(U) Theoretical Investigation of Laser-Sustained Argon Plasmas.

OCT 86 9P

PERSONAL AUTHORS: Jeng, San-Mou; Keefer, Dennis R.

CONTRACT NO. AFOSR-83-0043

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0807

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Applied Physics, v80  
n7 p2272-2279, 1 Oct 86.

ABSTRACT: (U) A theoretical model has been developed for laser-sustained argon plasmas in a forced convective axisymmetric pipe flow. The two-dimensional model based on Navier-Stokes equations was solved using a finite difference algorithm, and included geometric optics, temperature-dependent thermodynamic, transport, and optical properties, as well as radiation-induced thermal conductivity. The results showed good agreement with existing experimental data on temperature distribution, shape, and size of the plasma. The calculated velocity distribution revealed the complexity of the flow field and indicated that the constant axial mass flux (product of axial velocity and density) assumption adopted by existing one-dimensional and semi-two-dimensional models is not adequate. The radiation transfer was found to have a significant influence on the predicted temperature distribution and peak temperature of laser-sustained plasmas. Keywords: Laser sustained; Plasmas; Axisymmetric; Navier Stokes; Temperature dependent; Thermodynamic.

DESCRIPTORS: (U) \*FLOW FIELDS, \*RADIATIVE TRANSFER, \*ARGON LASERS, ALGORITHMS, DISTRIBUTION, EXPERIMENTAL DATA, FINITE DIFFERENCE THEORY, FLUX(RATE), GEOMETRY, MASS FLOW, MODELS, NAVIER STOKES EQUATIONS, OPTICAL

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PROPERTIES, OPTICS, PEAK VALUES, RADIATION EFFECTS,  
TEMPERATURE, THEORY, THERMAL CONDUCTIVITY, TWO  
DIMENSIONAL, VELOCITY, REPRINTS.

POLYTECHNIC UNIV BROOKLYN NY

(U) In Situ Fault Detection by the Hybrid Ray Mode Method.

IDENTIFIERS: (U) PE81102F, WJAFOSR2308A1.

DESCRIPTIVE NOTE: Annual technical rept. 1 Mar 87-29 Feb 88,

FEB 88 25P

PERSONAL AUTHORS: Felsen, L. B.

CONTRACT NO. AFOSR-86-0318

PROJECT NO. 2308

TASK NO. A3

MONITOR: AFOSR  
TR-88-0545

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this research effort has been to develop algorithms for in situ location, by ultrasound, of flaws in plates or laminated layered materials. Achieving this objective requires detailed knowledge of the excitation, propagation, scattering and detection of high frequency sound waves in the flawed environment. Based on an understanding of these fundamental wave phenomena, one may then attempt to construct analytical models with accompanying algorithms, so as to parametrize the Nonlinear Differential Equation problem in terms of good observables.

DESCRIPTORS: (U) \*NONDESTRUCTIVE TESTING, \*DEFECT ANALYSIS, \*ULTRASONICS, ALGORITHMS, FAULTS, HIGH FREQUENCY, HYBRID SYSTEMS, LAMINATES, LAYERS, MATERIALS, MATHEMATICAL MODELS, NONLINEAR DIFFERENTIAL EQUATIONS, SCATTERING, SOUND WAVES, ACOUSTIC DETECTION.

IDENTIFIERS: (U) PE81102F, WJAFOSR2306A3.

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SEARCH CONTROL NO. EVI46A

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT  
OF MATHEMATICS

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT  
OF MATHEMATICS

(U) Boundary Control of the Timoshenko Beam,

(U) Boundary Stabilization of an Euler-Bernoulli Beam with  
Viscoelastic Damping,

NOV 87

DEC 87

PERSONAL AUTHORS: Kim, Jong U.; Renardy, Yuriko

PERSONAL AUTHORS: Desch, Wolfgang; Hannsgen, Kenneth B.;  
Renardy, Yuriko; Wheeler, Robert L.

CONTRACT NO. AFOSR-86-0085

PROJECT NO. 2304

CONTRACT NO. AFOSR-86-0085

TASK NO. A1

PROJECT NO. 2304

MONITOR: AFOSR  
TR-88-0592

MONITOR: AFOSR

TR-88-0590

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in SIAM Jnl. of Control and  
Optimization, v25 n6 p1417-1429 Nov 87.

SUPPLEMENTARY NOTE: Pub. in Proceedings of the Conference  
on Decision and control (28th), p1792-1795 Dec 87.

ABSTRACT: (U) It is shown that the Timoshenko beam can  
be uniformly stabilized by means of a boundary control. A  
numerical study on the spectrum is also presented.  
Keywords: Timoshenko beam; Uniform stabilization;  
Exponential decay; Boundary control; Energy method; C sub  
O Semigroup; Linear stability; Eigenvalues; Spectral  
method; Reprints.

ABSTRACT: (U) Boundary feedback schemes for stabilizing  
flexural vibrations in a linear viscoelastic beam are  
studied. It is shown that in the Euler-Bernoulli model an  
arbitrarily small feedback delay can cause unbounded  
vibrations with arbitrarily large exponential growth  
rates. For the Timoshenko beam, in the purely elastic  
case, a contrasting result is given, and formulas for the  
decay rates of high frequency modes are developed for the  
case of no feedback delay. Numerical results for various  
no-delay cases are summarized.

DESCRIPTORS: (U) \*TIMOSHENKO BEAM, BOUNDARIES,  
EIGENVALUES, ENERGY, LINEARITY, NUMERICAL ANALYSIS,  
REPRINTS, SPECTRA, STABILITY, STABILIZATION, MOMENT OF  
INERTIA, MODULUS OF ELASTICITY.

IDENTIFIERS: (U) Euler Beam Equations, Euler Equations,  
PEB1102F, WUAFOSR2304A1.

DESCRIPTORS: (U) \*BOUNDARIES, \*DAMPING, \*VISCOELASTICITY,  
BEAMS(STRUCTURAL), DECAY, DELAY, ELASTIC PROPERTIES,  
EXPONENTIAL FUNCTIONS, FEEDBACK, FLEXURAL PROPERTIES,  
GROWTH(GENERAL), HIGH FREQUENCY, LINEAR SYSTEMS,  
NUMERICAL ANALYSIS, RATES, REPRINTS, STABILIZATION,  
TIMOSHENKO BEAM, VIBRATION.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A1.

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG

(U) On the Initial-Boundary Value Problem for a Bingham Fluid in a Three Dimensional Domain,

DEC 87 21P

PERSONAL AUTHORS: Kim, Jong U.

CONTRACT NO. AFOSR-88-0085, NSF-DMS85-21848

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0593

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Transactions of the American Mathematical Society, Vol 12 p751-770 Dec 87.

ABSTRACT: (U) This paper explores the motion planning problem for multiple moving objects. The approach taken consists of assigning priorities to the objects, then planning motions one object at a time. For each moving object, the planner constructs a configuration space-time that represents the time-varying constraints imposed on the moving object by the other moving and stationary objects. The planner represents this space-time approximately, using two-dimensional slices. The space-time is then searched for a collision-free path. The paper demonstrates this approach in two domains. One domain consists of translating planar objects; the other domain consists of two-link planar articulated arms. Keywords: Artificial Intelligence.

DESCRIPTORS: (U) \*VISCOPLASTIC PROPERTIES, \*FLUIDS, BOUNDARY VALUE PROBLEMS, EXTERNAL, REPRINTS, SOLUTIONS(GENERAL), THREE DIMENSIONAL, CONVERGENCE.

IDENTIFIERS: (U) \*Bingham fluids, Initial value problems, Existence theorems, Uniqueness theorems, PE61102F, WJAFOSR2304A1.

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VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT OF MATHEMATICS

(U) Time Delays and Boundary Feedback Stabilization in One-Dimensional Viscoelasticity,

JUL 86

PERSONAL AUTHORS: Hannsgen, Kenneth B.; Wheeler, Robert L.

CONTRACT NO. AFOSR-88-0085, NSF-DMS85-00947

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0591

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Lecture Notes in Control and Information Sciences, Distributed Parameter Systems. Proceedings of International Conference (3rd), p136-152, 12 Jul 86.

ABSTRACT: (U) The effects of time delays in a boundary feedback mechanism employed to stabilize the longitudinal vibrations in a one dimensional viscoelastic rod are studied. The existence of exponentially growing vibration is related to various types of stress-strain laws for the material.

DESCRIPTORS: (U) \*BOUNDARIES, \*VIBRATION, \*VISCOELASTICITY, DELAY, FEEDBACK, ONE DIMENSIONAL, REPRINTS, RODS, STABILIZATION, TIME INTERVALS.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304A1.

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SEARCH CONTROL NO. EVI48A

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UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Negative Ion Formation in Lithium Atom Collisions.

DESCRIPTIVE NOTE: Journal article.

88

11P

PERSONAL AUTHORS: Michels, H. H.; Montgomery, J. A., Jr

REPORT NO. UTRC/927258-4

CONTRACT NO. F49620-88-C-0095

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-88-0628

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of the International Symposium on the Production and Neutralizations of Negative Ions and Beams, 1988.

ABSTRACT: (U) The formation of Li- by dissociative attachment in e + Li2 collisions is characterized by a large cross section for electron attachment to highly vibrationally excited Li2 molecules. However, the electronic structure of the Li2 system dictates that low energy electrons (< or = 2 eV) are needed to minimize loss processes. An alternate production route for Li- is possible via direct ion-pair formation through collisions of highly excited (Rydberg) Li atoms. The mechanisms for ion-pair formation will be discussed in terms of the highly lying molecular Rydberg states of Li2. Keywords: Negative ion, Potential energy curves, Electronic structure, Lithium.

DESCRIPTORS: (U) \*ANIONS, \*COLLISIONS, \*LITHIUM, ATOMS, ATTACHMENT, CROSS SECTIONS, DISSOCIATION, ELECTRONICS, ELECTRONS, LOSSES, LOW ENERGY, REPRINTS.

IDENTIFIERS: (U) PE61102F, WDAFOSR2301A7.

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UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Electronic Structure and Stability of Small Cation and Anion Hydrogen Clusters.

DESCRIPTIVE NOTE: Journal article.

88

12P

PERSONAL AUTHORS: Michels, H. H.; Montgomery, J. A., Jr

REPORT NO. UTRC/927258-5

CONTRACT NO. F49620-88-C-0095, F40811-88-C-0071

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-88-0628

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of the Cooling, Condensation and Storage of Hydrogen Cluster Ions Workshop, 1988.

ABSTRACT: (U) Ab initio calculations of the electronic structure of Hn- and Hn+ clusters have been carried out using accurate Gaussian basis sets and with levels of theory up to fourth-order perturbation theory (MP4) and single and double excitation configuration interaction (CISD). The odd hydrogen cation addition sequence, Hn+ + H2 - Hn+2, appears to be thermodynamically stable for large size cluster formation. The even H8+ cation also exhibits surprising stability in D2d symmetry. In contrast, the hydrogen anion addition sequences, Hn- +2dH - Hn-1 and Hn- + H2 - Hn-2, appear to be thermoneutral or unstable. Keywords: Cluster ions, Electronic structure.

DESCRIPTORS: (U) \*ANIONS, \*CATIONS, \*CLUSTERING, \*HYDROGEN, \*STABILITY, \*IONIC CURRENT, ADDITION, CONFIGURATIONS, ELECTRONICS, EXCITATION, INTERACTIONS, IONS, THERMODYNAMICS, REPRINTS.

IDENTIFIERS: (U) \*Ionic hydrogen clusters, \*Electron structure, Advanced propulsion systems, PE61102F,

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WJAFOSR2301A7.

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UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) The Electronic Structure and Stability of the H-3 Anion.

DESCRIPTIVE NOTE: Journal article,

SEP 87 8P

PERSONAL AUTHORS: Michels, H. H.; Montgomery, J. A., Jr

REPORT NO. UTRC/927528-3

CONTRACT NO. F49620-85-C-0085

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-88-0627

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters,  
v139 n8 p535-539, 11 Sep 87.

ABSTRACT: (U) A systematic study of the electronic structure of the H<sub>3</sub>- anion has been carried out using both perturbation theory and configuration interaction. Counterpoise corrections are used to estimate the basis set superposition error in the computed dissociation energy. We find that H<sub>3</sub>- is not thermodynamically stable relative to H- + H<sub>2</sub> upon consideration of the vibrational zero-point contribution to the dissociation energy. Isotopic analysis predicts weak stability, however, for D<sub>3</sub>- and D<sub>2</sub>-H-. Keywords: Electronic structure, Negative ion vibrational frequency, Dissociation energy, Hydrogen, Deuterium.

DESCRIPTORS: (U) \*CONFIGURATIONS, \*DEUTERIUM, \*HYDROGEN, ANIONS, CHEMICAL DISSOCIATION, ELECTRONICS, ENERGY, FREQUENCY, INTERACTIONS, ISOTOPES, LOW STRENGTH, PERTURBATION THEORY, STABILITY, VIBRATION, REPRINTS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2301A7.

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES

TEXAS UNIV AT AUSTIN DEPT OF PHYSICS

(U) Measurement of the Valence-Band Discontinuities for Molecular Organic Semiconductor/Inorganic Semiconductor Heterojunctions.

(U) Surface Vibrations on Clean and Hydrogen Saturated W(100).

APR 88 5P

87 13P

PERSONAL AUTHORS: So, F. F.; Forrest, S. R.

PERSONAL AUTHORS: Erskine, J. L.; Woods, J. P.; Kulkarni, A. D.; De Wette, F. W.

CONTRACT NO. AFOSR-87-0273

CONTRACT NO. F49620-86-0045, \$AFOSR-86-0109

PROJECT NO. 2308

PROJECT NO. 2303

TASK NO. B1

TASK NO. A2

MONITOR: AFOSR TR-88-0580

MONITOR: AFOSR TR-88-0873

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Applied Physics Letter. v52 n10 p1341-1343, 18 Apr 88.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Electron Spectroscopy and Relate Phenomena, v44 p27-36 1987.

ABSTRACT: (U) The source of this interest lies in the ability of heterojunctions to control optical fields and charge transport in numerous devices such as semiconductor lasers and photodetectors used in optoelectronic applications. Furthermore, the ability to grow epitaxial materials with atomic scale precision has led to the realization of multiple quantum well structures which exhibit a wealth of exciting new physical phenomena, some of which are already finding novel device applications.

ABSTRACT: (U) Electron energy loss spectroscopy (EELS) and lattice dynamical calculations are used to investigate the vibrational properties of surface phonons and adsorbate phonons on clean and hydrogen-saturated tungsten (100). Two distinct intrinsic surface vibrations are observed in specular scattering geometry. One of the surface modes is attributed to a surface resonance of a bulk longitudinal phonon at the hydrogen-stabilized (1x1) surface. The second surface mode occurs only on the low-temperature-stabilized c(2x2) displacement surface. Detailed experimental studies and lattice dynamical analysis of the hydrogen-saturated W(100) surface accounts for a new hydrogen-derived loss peak at 118 meV in terms of an optic mode of the adsorbed layer. Experimental evidence of impact scattering resonances under certain kinematic conditions are observed.

DESCRIPTORS: (U) \*PHOTODETECTORS, \*SEMICONDUCTOR LASERS, \*VALENCE BANDS, CHARGE TRANSFER, CONTROL, DISCONTINUITIES, ELECTROOPTICS, EPITAXIAL GROWTH, MATERIALS, OPTICAL PROPERTIES, PHYSICAL PROPERTIES, QUANTUM ELECTRONICS, STRUCTURES, REPRINTS.

IDENTIFIERS: (U) PES1102F, WJAFOSR2306B1.

DESCRIPTORS: (U) \*SURFACES, \*VIBRATION, \*TUNGSTEN, ADSORPTION, DISPLACEMENT, ELECTRON ENERGY, ELECTRON SPECTROSCOPY, EXPERIMENTAL DATA, GEOMETRY, IMPACT, KINEMATICS, LAYERS, LOSSES, OPTICS, PHONONS, PHYSICAL PROPERTIES, REPRINTS, RESONANCE, SCATTERING, SPECULAR REFLECTION.

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IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2.

TEXAS UNIV AT AUSTIN DEPT OF PHYSICS

(U) Electronic Properties of Nb and H-Treated Nb Surfaces.

NOV 87 5P

PERSONAL AUTHORS: Fang, Bo-Shung; Ballentine, C. A.;  
Erskine, J. L.

CONTRACT NO. AFOSR-88-0109

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-88-0874

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review B, V36 NO. 15  
Nov 87.

ABSTRACT: (U) Clean niobium and hydrogen-treated Nb  
surfaces are studied using angle-resolved photoemission.  
Intrinsic surface states and hydrogen-induced states are  
characterized along the gamma - X direction of the two  
dimensional Brillouin zone. Hydrogen-induced states  
exhibit reversible temperature-dependent effects  
providing direct experimental evidence of the self-  
trapped surface states which have been proposed to  
account for novel properties associated with hydrogen  
uptake by Nb.

DESCRIPTORS: (U) \*NIOBIUM, BRILLOUIN ZONES, ELECTRONICS,  
HYDROGEN, REPRINTS, REVERSIBLE, TEMPERATURE, TWO  
DIMENSIONAL.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2.

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TEXAS UNIV AT AUSTIN DEPT OF PHYSICS

(U) High-Resolution Low-Energy Electron Reflection from W(100) using the Electron Energy-Loss Spectrometer: A Step Towards Quantitative Analysis of Surface Vibrational Spectra.

AUG 87 8P

PERSONAL AUTHORS: Woods, J. P.; Erskine, J. L.

CONTRACT NO. AFOSR-86-0109

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-86-0631

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Vacuum Science and Technology A, v5 n4 p435-439 Jul-Aug 87.

ABSTRACT: (U) High-resolution low-energy electron reflection measurements and electron energy-loss measurements for clean W(100) and for the hydrogen saturated phase (B sub 1) on W(100) are reported. The ability to perform both low-energy reflectance, low-energy electron diffraction, and high-resolution electron energy-loss experiments on the same crystal using the same electron optics permits several novel experiments. For example, it is possible to quantitatively test the dipole scattering mechanism and examine dipole and impact loss cross sections under precisely defined scattering conditions (i.e., under diffracted beam emergence conditions or at energies corresponding to reflectance resonance conditions). Under certain scattering conditions, the dipole scattering selection rule is shown to break down. Suitable modifications of the electron optics control electronics also permit direct measurements of the cross-section energy dependence of vibrational losses. These new features represent an important step towards quantitative applications of vibrational spectroscopy based on comparing electron energy-loss spectroscopy signals from chemisorbed species on different crystal surfaces.

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DESCRIPTORS: (U) \*ELECTRON ENERGY, \*VIBRATIONAL SPECTRA, CONTROL, CROSS SECTIONS, CRYSTALS, DIFFRACTION, DIPOLES, ELECTRON DIFFRACTION, ELECTRON OPTICS, ELECTRON SPECTROSCOPY, ELECTRONICS, ELECTRONS, ENERGY, HIGH RESOLUTION, HYDROGEN, LOSSES, LOW ENERGY, MEASUREMENT, QUANTITATIVE ANALYSIS, REFLECTANCE, REFLECTION, REPRINTS, RESONANCE, SATURATION, SCATTERING, SIGNALS, SPECTROSCOPY, SURFACES, VIBRATION, TUNGSTEN.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303A2.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

REPRINTS, SHRINKAGE, STATIC ELECTRICITY, SURFACES,  
THICKNESS.

(U) Surface Plasmon Study of Electrochemically Prepared  
Polymers: Polyazulene.

IDENTIFIERS: (U) \*Polyazulene, PE81102F, WUAFOSR2303A3.

NOV 87 10P

PERSONAL AUTHORS: Huang, X.; Zhao, M. Y.; Janiszewska, L.;  
Prasad, P. N.

REPORT NO. SUNY/AB/TR-17

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
R-88-0825

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Synthetic Metals, v24 p245-  
253 1988.

ABSTRACT: (U) The work reported here shows that by using a modified gold working electrode, the surface plasmon technique can successfully be used to obtain information on the optical constants and the film thickness of electropolymerized films. Polyazulene films deposited at three different surface charge densities are investigated in the oxidized and corresponding reduced forms. Our result shows that the refractive index, and hence the dielectric constant at 632 nm, is complex, the imaginary part being larger for the oxidized form compared to that for the corresponding reduced form. Thickness determination shows that its relationship with the amount of charge is qualitatively similar to that reported for polypyrrole. The film thickness measurement reveals a shrinkage in going from the oxidized to the reduced form as the counter anions are removed. Our study, therefore, shows that the surface plasmon technique can be used to probe ionic processes.

DESCRIPTORS: (U) \*FILMS, \*POLYMERS, CHARGE DENSITY,  
CONSTANTS, DETERMINATION, ELECTRODES, GOLD, MEASUREMENT,  
OPTICAL PROPERTIES, PLASMONS, PYRROLES, REFRACTIVE INDEX.

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STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

ORGANIC MATERIALS, POLYMERS, REACTION TIME, SIGNAL PROCESSING, OPTICAL SWITCHING, REFRACTIVE INDEX.

(U) Design, Ultrastructure, and Dynamics of Nonlinear Optical Effects in Polymeric Thin Films.

IDENTIFIERS: (U) PE81102F, WJAFOSR2303A3.

88 28P

PERSONAL AUTHORS: Prasad, Paras N.

REPORT NO. SUNY/AB/TR-18

CONTRACT NO. F49620-85-C-0052

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-88-0634

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Nonlinear Optical and Electroactive Polymers, p41-47 1988.

ABSTRACT: (U) The topic of nonlinear optical effects is currently at the forefront of research because of its potential application to optical signal processing and optical computing. Organic systems can be expected to play a significant role because of their relatively large nonresonant optical nonlinearity and subpicosecond response time. This paper presents a review of recent work conducted in the author's laboratory and also reports some new previously unpublished results. Our research program on organic nonlinear optics is a comprehensive one which covers the following aspects: (1) Microscopic understanding of optical nonlinearities, (2) Syntheses of novel nonlinear organic polymers, (3) Design and molecular engineering of polymeric thin films, (4) Ultrastructure determination for these films, and (5) Study of nonlinear optical effects. Keywords: Ultrastructure, Dynamics, Nonlinear optical effects, Polymeric thin films.

DESCRIPTORS: (U) \*POLYMERIC FILMS, \*THIN FILMS, \*OPTICAL MATERIALS, COMPUTATIONS, DYNAMICS, ENGINEERING, LABORATORIES, MOLECULES, NONLINEAR SYSTEMS, OPTICAL PROCESSING, OPTICAL PROPERTIES, OPTICS, ORGANIC COMPOUNDS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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HUGHES RESEARCH LABS MALIBU CA

(U) Cluster Beam Studies.

DESCRIPTIVE NOTE: Final rept. 1 Aug 85-31 Oct 87.

APR 88 69P

PERSONAL AUTHORS: Knauer, W.; Poeschel, R. L.

CONTRACT NO. F49620-85-C-0125

PROJECT NO. 2308

TASK NO. 82

MONITOR: AFOSR  
TR-88-0544

UNCLASSIFIED REPORT

ABSTRACT: (U) Cluster beams offer a means of depositing high-quality thin films at low substrate temperature for microelectronics fabrication. The advantage of cluster beam depositions is the ability to optimize the energy of the impacting particles, either directly in clustered vapors of nonvolatile materials or indirectly by bombarding the film during deposition with clusters of inert gases. When a cluster beam is ionized and accelerated through several thousand volts, clusters that contain 1000 or more atoms strike the surface with several electron volt energy per atom. The suprathermal energy of the depositing atoms is thought to produce unique thin films (either in quality, or in the ability to be deposited at all). This report describes the general effort on cluster beam formation methods, on cluster ionization by electron bombardment in a gridded ionization cell, on electrostatic mass separation, and on electrostatic acceleration to a predetermined velocity. Detailed results are given on the improvements in performance of ionization cells for clusters beams of nonvolatile and gaseous materials.

DESCRIPTORS: (U) \*DEPOSITION, \*THIN FILMS, \*PARTICLE BEAMS, ACCELERATION, ATOMS, BEAM FORMING, CELLS, CLUSTERING, ELECTRON ENERGY, ELECTRON IRRADIATION, ELECTROSTATICS, ENERGY, FABRICATION, GASES, GRIDS, INERT MATERIALS, IONIZATION, LOW TEMPERATURE, MASS.

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MICROELECTRONICS, NONVOLATILE MEMORIES, SEPARATION, SUBSTRATES, THERMAL PROPERTIES, VAPORS, VOLTAGE.

IDENTIFIERS: (U) Cluster beams.

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ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF PHYSICS

MINNESOTA UNIV MINNEAPOLIS DEPT OF MECHANICAL  
ENGINEERING

(U) MBE Growth, Characterization and Electronic Device  
Processing of HgCdTe, HgZnTe, Related Heterojunctions  
and HgCdTe-CdTe Superlattices.

(U) Studies of Gas Turbine Heat Transfer Airfoil Surface  
and End-Wall Cooling Effects.

DESCRIPTIVE NOTE: Quarterly rept.,

DESCRIPTIVE NOTE: Annual rept. Mar 87-Mar 88,

SEP 87

MAR 88

PERSONAL AUTHORS: Faurie, Jean-Pierre

PERSONAL AUTHORS: Eckert, E. R.; Goldstein, R. J.;  
Patankar, S. V.; Simon, T. W.

CONTRACT NO. F49620-87-C-0021

CONTRACT NO. F49620-85-C-0049

MONITOR: AFOSR  
TR-87-16226

PROJECT NO. 2307

UNCLASSIFIED REPORT

TASK NO. A4

MONITOR: AFOSR  
TR-88-0546

UNCLASSIFIED REPORT

ABSTRACT: (U) A strong emphasis has been laid recently on the characterization of HgCdTe epilayers by double X ray rocking curve. A careful examination of what has been up to now reported is far from being conclusive. In fact what is claimed as world record is only one particular point on a crystal. Above all, nobody has presently established a clear relationship between the FWHM of X ray Rocking Curve peak and the electrical characteristics of this HgCdTe layer. We have just received our own equipment during the Summer 87 and have started our own investigations. What we have in mind is (1) to understand the relationship between FWHM of the substrate - FWHM of the epilayer, (2) to establish a relationship between FWHM mobility and carrier lifetime for a given HgCdTe MBE layer grown under very well established growth conditions. We have already characterized numerous substrates and HgCdTe epilayers grown in the (111) orientation on CdTe and CdZnTe substrates.

DESCRIPTORS: (U) \*CADMIUM TELLURIDES, \*MERCURY COMPOUNDS, \*SUBSTRATES, ELECTRICAL PROPERTIES, ELECTRONIC EQUIPMENT, ENVIRONMENTS, GRAPHS, GROWTH(GENERAL), LIFE SPAN(BIOLOGY), PEAK VALUES, PROCESSING, X RAYS.

IDENTIFIERS: (U) PE81102F, \*Cadmium mercury tellurides, \*Mercury zinc tellurides, Superlattices, Molecular beam epitaxy, Mercury cadmium tellurides, Heterojunctions.

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SRI INTERNATIONAL MENLO PARK CA ARTIFICIAL INTELLIGENCE CENTER

SAN DIEGO STATE UNIV CA DEPT OF BIOLOGY

(U) Research on Problem-Solving Systems.

(U) The Effect of Acid Deposition on Potentially Sensitive Soil-Plant Systems at Vandenberg AFB, California.

DESCRIPTIVE NOTE: Final rept. 1 Oct 84-14 Feb 88.

DESCRIPTIVE NOTE: Final rept. 1 Sep 84-1 Sep 87.

FEB 88 164P

APR 88

PERSONAL AUTHORS: Wilkins, David E.

PERSONAL AUTHORS: Zedler, Paul H.; Marion, Giles

CONTRACT NO. F49620-85-K-0001

CONTRACT NO. AFOSR-84-0284

PROJECT NO. 2304

PROJECT NO. 2312

TASK NO. A7

TASK NO. A5

MONITOR: AFOSR  
TR-88-0563MONITOR: AFOSR  
TR-88-0568

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This is the final report for a research project which focused on artificial intelligence planning systems. The research investigated methods for representing, generating, and executing hierarchical plans that contain parallel actions. Reasoning about actions is critical to many important areas including automatic planning systems, expert consultation systems, and real-time control of robotic systems. This report describes progress in planning, including efficient techniques for generating hierarchical and parallel plans in certain domains. This work was performed using SIPE (System for Interactive Planning and Execution Monitoring) which was developed in part under this contract.

DESCRIPTORS: (U) \*ARTIFICIAL INTELLIGENCE, \*PROBLEM SOLVING, \*ROBOTICS, AUTOMATIC, CONTROL, EFFICIENCY, HIERARCHIES, INTERACTIONS, MONITORING, PARALLEL ORIENTATION, PLANNING, REAL TIME, REASONING.

IDENTIFIERS: (U) Expert systems, SIPE computer program, ZETALISP programming language. PE81102F, WUAFOSR2304A7, LPN-SRI-7888.

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ABSTRACT: (U) The objectives of this study were to assess the impact of the acid deposition expected from rocket launches on natural coastal vegetation and soils. Interest was directed primarily toward the longer-term and more subtle effects of acidity, and the degree of sensitivity of different soil-plant systems. A study area was established along a topographic chronosequence that ranged from stabilized dunes to residual soils over bedrock. Soils and plants were collected from this region and used in three main studies. A leaching study measured the changes in chemical properties of four soils subjected to repeated acid additions. A second study treated seeds of wide variety of native or spontaneous species with HCl on the four soils to establish the sensitivity of the vegetation to deposition events during the fall to winter germination pulse characteristic of California coastal ecosystems. A third study examined the effect of acid treatments on the growth of and competition between two common woody plants -- *Artemisia californica* and *Pinus muricata*. A fourth study partially supported by this grant studied the invasion of an exotic species in a recently burned site on one of the four study soils. The studies collectively show that although the soil-plant systems are well buffered against moderate and low inputs of acidity, the effect of acid additions differed among soil types and from species to species.

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Overall the hypothesis that acidic deposition could affect plant-plant and soil-plant interactions was supported, but some of these effects are subtle and not all appear to be deleterious.

BDM CORP MCLEAN VA

(U) Optics and Symbolic Computing

DESCRIPTIVE NOTE: Semiannual rept. 14 Aug 87-31 Mar 88.

DESCRIPTORS: (U) \*ACID DEPOSITION, \*PLANTS(BOTANY), \*SOILS, \*ROCKET LAUNCHING, ACIDS, CALIFORNIA, CHEMICAL PROPERTIES, COASTAL REGIONS, DEPOSITION, DUNES, ECOSYSTEMS, GERMINATION, HYPOTHESES, INTERACTIONS, LEACHING, PULSES, RESIDUALS, SENSITIVITY, STABILIZATION, VEGETATION, WINTER, AIR FORCE FACILITIES, GEOCHEMISTRY, SEEDS, HYDROCHLORIC ACID, AUTUMN, PLANT GROWTH, SHRUBS, TREES, ENVIRONMENTAL IMPACT.

MAR 88 84P

PERSONAL AUTHORS: Athale, R.

REPORT NO. BDM/MCL-88-0182-TR

CONTRACT NO. F49820-88-C-0030, SARPA Order 4952

IDENTIFIERS: (U) MUAFOSR2312A5, PE81102F, Vandenberg Air Force Base, Soil chemistry.

MONITOR: AFOSR  
TR-88-0478

UNCLASSIFIED REPORT

ABSTRACT: (U) Sorting is central to the solution of many knowledge-based and switching problems in advance computation and communication systems. Parallel-pipelined sorting algorithms are appropriate for applications that demand high throughput, low delay and many data channels. One such algorithm, the bitonic sort, can be implemented with passive perfect shuffle interconnects between active stages of compare-and-exchange elements. This paper focuses on optical hardware to implement the C&E operation and show that by taking advantage of a distinctive feature of optical logic, namely bistability, comparison circuits of remarkable simplicity are attainable. Described are implementations of C&E in a variety of optical device technologies capable of performing latching and nonlatching logic. Based on the device characteristics potential application areas for each technology are outlined.

DESCRIPTORS: (U) \*LOGIC, \*OPTICAL EQUIPMENT, \*SWITCHING, \*SYMBOLS, ALGORITHMS, CHANNELS, COMMUNICATION AND RADIO SYSTEMS, DATA TRANSMISSION SYSTEMS, DELAY, HIGH RATE, OPTICAL PROPERTIES, OPTICS, SOLUTIONS(GENERAL).

IDENTIFIERS: (U) PE81102F.

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MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

GERMANIUM, HEATING, ION DENSITY, IONS, LOW STRENGTH, MASS, MIGRATION, MODELS, MOTION, RATES, RATIOS, SILICON, THERMAL PROPERTIES, TRANSITIONS, REPRINTS.

(U) Transition State Model for Grain Boundary Motion during Ion Bombardment.

IDENTIFIERS: (U) PE01102F, WJAFQSR230882.

88 18P

PERSONAL AUTHORS: Atwater, Harry A.; Thompson, Carl V.; Smith, Henry I.

CONTRACT NO. AFOSR-85-0154

PROJECT NO. 2308

TASK NO. B2

MONITOR: AFOSR TR-88-0682

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Materials Research Society Symposium Proceedings, V100 p345-356 1988.

ABSTRACT: (U) Ion bombardment of polycrystalline Ge, Si, and Au films leads to rates of grain boundary motion that greatly exceed rates of thermally-induced motion at the same temperature and which exhibit a weak temperature dependence. The enhanced migration rate is proportional to the rate of energy deposition in nuclear collisions at or very near the grain boundary. Experimental work is reviewed, and a transition state model is presented which accounts for the observed kinetics of grain boundary migration during bombardment. This model suggests that the rate limiting step in grain boundary motion may be thermally-induced migration of a bombardment-generated defect across the boundary. Also, the ratio of atomic jumps at grain boundaries to the local collision-induced Frankel defect generation rate is shown to be characteristic of each material, but independent of ion mass and ion flux. The model is extended to the motion of an interface between two phases, and applications to crystallization during ion bombardment are discussed. Keywords: Germanium, Silicon, Gold.

DESCRIPTORS: (U) \*GRAIN BOUNDARIES, \*ION BOMBARDMENT, CRYSTALLIZATION, DEPOSITION, ENERGY, FLUX(RATE).

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MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

(U) Interface-Limited Grain-Boundary Motion during Ion Bombardment,

JAN 98 11P

PERSONAL AUTHORS: Atwater, Harry A.; Thompson, Carl V.; Smith, Henry I.

CONTRACT NO. AFOSR-85-0154

PROJECT NO. 2308

TASK NO. B2

MONITOR: AFOSR  
TR-88-0581

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review Letters, v80 n2 p112-115, 11 Jan 88.

ABSTRACT: (U) Ion bombardment of polycrystalline Ge, Si, and Au films results in grain-boundary migration rates which are weakly temperature dependent, and which greatly exceed thermal migration rates. The enhanced migration rate is proportional to the rate of nuclear collisions at or very near the grain boundary. We present a transition-state model which accounts for the observed kinetics of grain-boundary migration during bombardment. The ratio of atomic jumps at grain boundaries to the local collision-induced Frenkel-defect generation rate is characteristic of each material. Keywords: Germanium, Silicon, Gold.

DESCRIPTORS: (U) \*GRAIN BOUNDARIES, \*ION BOMBARDMENT, GERMANIUM, KINETICS, MIGRATION, RATES, RATIOS, SILICON, THERMAL PROPERTIES, REPRINTS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2308B2.

AD-A195 111

AD-A195 099

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JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF CHEMISTRY

(U) On the Evaluation of Lifetimes for Spin-Forbidden Radiative Transitions Originating in Coupling to States Embedded in Continuum. Application to CH-

MAR 88 9P

PERSONAL AUTHORS: Lengsfeld, Byron H., III; Jensen, James O.; Yarkony, David R.

CONTRACT NO. AFOSR-88-0110, \$NSF-CHE84-21381

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-88-0820

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v88 n8 p3853-3860, 15 Mar 88.

ABSTRACT: (U) Recently there has been considerable interest in the determination of the lifetimes of spin-forbidden radiative processes within the context of the Breit-Pauli approximation using ab initio electronic structure techniques. Much of this work centered on the transitions in imidogen (NH) and the nitrogen halides NF and NCl. These states originate from the electron configuration  $pi^2 sq$ . The  $\Delta$  yields X3 epsilon transition derives its intensity through coupling to II, II spaces whose reference states are valence in character.

DESCRIPTORS: (U) \*CONFIGURATIONS, \*HYDROCARBONS, ELECTRONICS, ELECTRONS, HALIDES, NITROGEN, REPRINTS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2303B3.

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

AD-A195 091

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NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) A Novel Rearrangement in a 1,3-Bis(homocubyl) Ring System.

87

4P

PERSONAL AUTHORS: Marchand, Alan P.; Pei-Wen, Jin; Filippen-Anderson, Judith L.; Gillardi, Richard; Clifford, George

CONTRACT NO. AFOSR-84-0085

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-87-1837

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society Chemical Communications, p1107-1109 1987.

ABSTRACT: (U) When treated with potassium ferricyanide-sodium nitrite in the presence of base, methyl 3,10-dinitropentacyclo-(5.3.0.02.5.03.9.04.8) decane-1-carboxylate undergoes an unusual skeletal rearrangement to afford methyl 3,9-dinitro-exo-10-methoxypentacyclo(5.3.0.02.5.03.9.04.8)decane-8-carboxylate whose structure was confirmed via single crystal X-ray crystallographic analysis. Keywords: Nitro substituted, Bishomocubanes, Rearrangement, X ray crystallographic, Product analysis, Sodium nitrate, Carboxylates.

DESCRIPTORS: (U) \*CARBOXYL GROUPS, SODIUM NITRATES, X RAYS, CYCLIC COMPOUNDS.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B2.

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SIBLEY SCHOOL OF MECHANICAL AND AEROSPACE ENGINEERING  
ITHACA NY

(U) Direct Numerical Simulations of the Turbulent Mixing of a Passive Scalar.

MAR 88

PERSONAL AUTHORS: Eswaran, V.; Pope, S. B.

CONTRACT NO. AFOSR-85-0083

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-88-0583

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in The Physics of Fluids, v31 n3 p508-520 Mar 88.

ABSTRACT: (U) The evolution of scalar fields, or different initial integral length scales, in statistically stationary, homogeneous, isotropic turbulence is studied. The initial scalar fields conform, approximately, to double delta function probability density functions. The initial scalar to velocity integral length scale ratio is found to influence the rate of the subsequent evolution of the scalar fields, in accord with experimental observations of Warhaft and Lumley. On the other hand, the pdf of the scalar is found to evolve in a similar fashion for all the scalar fields studied; and, as expected, it tends to a Gaussian. The pdf of the logarithm of the scalar-dissipation rate reaches an approximately Gaussian self-similar state. The scalar-dissipation spectrum function also becomes self-similar. The evolution of the conditional scalar-dissipation rate is also studied. The consequences of these results for closure models for the scalar pdf equation are discussed. Keywords: Turbulent mixing; Direct numerical simulation; Reprints.

DESCRIPTORS: (U) \*TURBULENCE, \*DIGITAL SIMULATION, CLOSURES, EQUATIONS, EVOLUTION(GENERAL), LENGTH, MATHEMATICAL MODELS, MIXING, MODELS, NUMERICAL ANALYSIS.

AD-A195 048



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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PASSIVE SYSTEMS, REPRINTS, SCALAR FUNCTIONS, SCALE, TURBULENT FLOW, PROBABILITY DENSITY FUNCTIONS.

CORNELL UNIV ITHACA NY DEPT OF CHEMISTRY

(U) State-Resolved Photodissociation of OCS Monomers and Clusters,

IDENTIFIERS: (U) Double Delta Functions, \*Turbulent mixing, PE81102F, WIAFOSR2308A2.

MAR 88 19P

PERSONAL AUTHORS: Sivkumar, N.; Hall, G. E.; Houston, P. L.; Burak, I.

CONTRACT NO. AFOSR-88-0017, NSF-CHE83-14148

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-88-0598

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v88 n8 p3692-3708, 15 Mar 88.

ABSTRACT: (U) Photodissociation of OCS in the region from 222-248 nm has been investigated by monitoring the CO and S(1D2) primary photoproducts; as well as the secondary production of S(3P2), S(3P1) and S(3P0) using fluorescence induced by a tunable vacuum ultraviolet laser source based on four-wave mixing in magnesium vapor. The quantum yield of S(3P) was found to be  $0.00 \pm 0.01$ . The present more detailed investigation shows that the sole sulfur product appears to be S(1D). The CO photofragment is produced almost exclusively in  $v=0$  CO( $v=1$ )/CO( $v=0$ ) or  $v=0.02$ , but the rotational distribution is inverted and peaked at very high rotational levels. The peak shifts from J=58 for dissociation at 222 nm to J=31 at 248 nm. Doppler profiles of the CO rotational transitions reveal (1) that all observed levels are produced in coincidence with S(1D), (2) that for 222 nm photolysis the fragment recoil anisotropy shifts from a distribution characterized by  $\beta = 0$  near J=54, (3) that the CO velocity vector is aligned nearly perpendicular to its angular momentum. Keywords: oxygen, carbon, sulfur.

AD-A195 046

AD-A195 045

UNCLASSIFIED

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A195 045 CONTINUED

AD-A195 044 7/4

DESCRIPTORS: (U) \*CARBON, \*OXYGEN, \*PHOTODISSOCIATION,  
\*SULFUR, ANGULAR MOMENTUM, DISTRIBUTION, DOPPLER SYSTEMS,  
FLUORESCENCE, MAGNESIUM, MONOMERS, PEAK VALUES,  
PHOTOLYSIS, PROFILES, ROTATION, SHIFTING, VAPORS,  
REPRINTS.

CORNELL UNIV ITHACA NY DEPT OF CHEMISTRY

(U) Angular Correlations between Recoil Velocity and  
Angular Momentum Vectors in Molecular  
Photodissociation.

IDENTIFIERS: (U) P681102F, WJAFOSR2303B1.

MAR 88 11P

PERSONAL AUTHORS: Sivkumar, N.; Hall, G. E.; Houston, P.  
L.; Burak, I.

CONTRACT NO. AFOSR-88-0017, SNSF-CHE83-14146

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-88-0815

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v88  
n8 p3682-3691, 15 Mar 88.

ABSTRACT: (U) A technique has been developed for  
determining the angular correlation between a  
photofragment's angular momentum vector  $J$ , its recoil  
velocity vector  $v$ , and the transition dipole moment of  
the parent molecule  $mc(p)$ . Doppler profile spectroscopy  
used in conjunction with laser-induced fluorescence  
probing by polarized light can be used to determine the  
correlations. The pairwise correlations between these  
vectors as well as for the triple correlation are  
discussed for limiting cases using a classical approach  
as well as for the general case using a quantum approach  
based on density matrices. The current formulations  
differ in two ways from the recent approach of Dixon, who  
used a bipolar expansion of the correlated velocity and  
angular momentum distributions. The physical basis for  
the influence of the vector correlations on the Doppler  
profile is somewhat more transparent in the current  
formulations, and the direct connection between the  
measured correlations and the  $t$ -matrix elements occurring  
in the theory of Balint-Kurti and Shapiro for the  
photodissociation of a diatomic molecule is also  
demonstrated.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A195 044 CONTINUED

AD-A195 043 7/5 7/3

DESCRIPTORS: (U) \*LASER INDUCED FLUORESCENCE, \*PHOTODISSOCIATION, ANGLES, ANGULAR MOMENTUM, BIPOLAR SYSTEMS, CORRELATION, DIPOLE MOMENTS, DISTRIBUTION, EXPANSION, FORMULATIONS, LIGHT, LIMITATIONS, MOLECULES, POLARIZATION, POLYATOMIC MOLECULES, QUANTUM THEORY, RECOIL, VECTOR ANALYSIS, VELOCITY.

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Polarity Dependent Barriers and the Photoisomerization Dynamics of Polar Molecules in Solution.

88 7P

IDENTIFIERS: (U) PE61102F, WUAFOSR230381.

PERSONAL AUTHORS: Hicks, J. M.; Vandersall, M. T.; Sitzmann, E. V.; Eisenthal, K. B.

CONTRACT NO. AFOSR-84-0013

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR TR-88-1513

UNCLASSIFIED REPORT

ABSTRACT: (U) To investigate the effects of the solvent on the photoisomerization kinetics of DMABN, we have carried out studies in a series of linear alcohols, alcohol/alkane mixtures, linear nitriles and nitrile/alkane mixtures (part of the data has been reported).

DESCRIPTORS: (U) \*PHOTOCHEMICAL REACTIONS, \*ISOMERIZATION, \*BENZONITRILES, \*SOLVENTS, ALCOHOLS, ALKANES, BARRIERS, MOLECULES, NITRILES, POLARITY, METHYL RADICALS, AMINES, SOLUTIONS(MIXTURES), REACTION KINETICS.

IDENTIFIERS: (U) \*Photoisomerization, Benzonitrile/P-dimethylamine, DMABN(P-Dimethylamino-Benzonitrile), PE61102F, WUAFOSR230382.

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## DYIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

AD-A195 042

7/2

## JOINT INST FOR LAB ASTROPHYSICS BOULDER CO

- (U) Collisional Transfer Within the  $Sr(5\ 3P^+ \text{ sub } J)$  Multiplet Due to Nearly Adiabatic Collisions with Noble Gases.

APR 88

PERSONAL AUTHORS: Kelly, J. F.; Harris, M.; Gallagher, A.

CONTRACT NO. AFOSR-84-0272

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-88-0824

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review A, V37 n7  
p2354-2360, 1 Apr 88.

ABSTRACT: (U) A time-resolved study of the  $Sr(53pJ)$  intramultiplet collisional mixing, following optical excitation of the  $3P_1$  state, is presented. The degeneracy-averaged rate coefficient of  $Sr(53pJ\ 53pJ)$  due to collisions with each of the noble gases in a quastequilibrium cell are derived from least-squares fittings of the triexponential time behavior of  $53p_1$  fluorescence and  $53p_2, 0\ 53s_1$  absorption data. A  $53p_1$  radiative rate of  $22 \pm 0.5$  micro is also obtained. The dependence of the rates upon buffer pressure demonstrated the presence of both linear and quadratic terms, due to two- and three-body reactions, respectively. The behavior of the binary rate coefficients with varying noble-gas species and temperature is qualitatively consistent with Stuckelberg's model for noncrossing levels. Keywords: Collisions; Energy transfer; Strontium.

DESCRIPTORS: (U) \*COLLISIONS, \*ENERGY TRANSFER, \*RARE GASES, ADIABATIC CONDITIONS, BEHAVIOR, BUFFERS, CELLS, EQUILIBRIUM(GENERAL), EXCITATION, FITTINGS, LEAST SQUARES METHOD, OPTICS, PRESSURE, QUADRATIC EQUATIONS, STRONTIUM, TIME, TRANSFER, REPRINTS.

IDENTIFIERS: (U) PE61102F, WJAFOSR230381.

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## UNCLASSIFIED

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## JOINT INST FOR LAB ASTROPHYSICS BOULDER CO

- (U) Steady State Model for the Collision Induced Rotational Alignment of Molecular Ions in Electric Drift Fields.

88 13P

PERSONAL AUTHORS: Meyer, Henning; Leone, Stephen R.

CONTRACT NO. AFOSR-88-0018

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-88-0849

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Molecular Physics, V63 n4  
p705-717 1988.

ABSTRACT: (U) A relationship is derived between the state multipole moments which characterize the deviation in an ensemble of rotors from an isotropic MJ distribution and the microscopic state multipole cross sections for rotational energy transfer in an atom-diatom system. The result is obtained for cylindrical collision symmetry under steady state conditions. We allow for the possibility that the velocity distribution, which is used to calculate the rates is dependent on the rotational angular momentum quantum numbers  $J$  and  $M_J$ . Using an approximate velocity distribution we show how the rotational alignment of molecular ions colliding with a buffer gas in an electric drift field can be related to the zeroth and second order tensor cross sections. The theory is discussed in terms of the rotational alignment resulting when  $N_2^+$  ions are drifted in He. Keywords: Alignment; Drift field; Tensor cross section; Theory; State multipole.

DESCRIPTORS: (U) \*ALIGNMENT, \*MOLECULAR IONS, \*MOLECULAR ROTATION, BUFFERS, COLLISIONS, CROSS SECTIONS, CYLINDRICAL BODIES, DISTRIBUTION, DRIFT, ELECTRIC FIELDS, ENERGY TRANSFER, GASES, MODELS, MOMENTS, MULTIPOLARITY, STEADY STATE, SYMMETRY, TENSORS, VELOCITY, REPRINTS.

AD-A195 041

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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CALIFORNIA UNIV BERKELEY DEPT OF MECHANICAL ENGINEERING

IDENTIFIERS: (U) Multiple moments, PE81102F,  
WJAFOSR230381.

(U) Unsteady Navier-Stokes Solution for Two Interacting,  
Vaporizing Droplets.

JAN 87 18P

PERSONAL AUTHORS: Raju, M. S.; Strignano, M. A.

CONTRACT NO. AFOSR-86-0018

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-88-0584

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in AIAA Aerospace Sciences  
Meeting (25th), p1-13, 15 Jan 87.

ABSTRACT: (U) Numerical solution of the coupled liquid-  
and gas-phase, unsteady Navier-Stokes equations, in  
axisymmetric configuration for two vaporizing droplets in  
tandem with the free stream velocity at zero angle of  
attack and whose initial Reynolds numbers are of  $O(100)$ ,  
has been obtained by making use of an implicit finite-  
difference scheme. The governing equations are solved in  
generalized coordinates subjects to constantly changing  
boundaries. The droplet Reynolds number, droplet radii  
and droplet spacing are time dependent and are determined  
by the drag forces and by the transport processes  
associated with the respective droplets. The results  
indicate that the interaction between vaporizing droplets  
is very significant as the relative difference in drag  
forces encountered by the droplets reduces the droplet  
spacing from eleven to less than two droplet diameters.  
After this reduction in spacing, more than 90% of the  
droplet mass remains to be vaporized, and the Nusselt  
number of the downstream droplet exhibits entirely  
different character as the hot side on the droplet  
surface moves aft. Keywords: Fuel droplet, Spray  
combustion.

DESCRIPTORS: (U) \*COMBUSTION, \*FUEL SPRAYS, AXISYMMETRIC,  
CONFIGURATIONS, COUPLING(INTERACTION), DIAMETERS, DRAG,

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AD-A195 039 12/4

FINITE DIFFERENCE THEORY, FREE STREAM, FUELS, HIGH TEMPERATURE, LIQUIDS, LOADS(FORCES), MASS, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, RADIUS(MEASURE), REYNOLDS NUMBER, SOLUTIONS(GENERAL), SPATIAL DISTRIBUTION, SURFACES, TRANSPORT PROPERTIES, VELOCITY, UNSTEADY FLOW, NAVIER STOKES EQUATIONS, REPRINTS.

CALIFORNIA UNIV BERKELEY DEPT OF ELECTRICAL ENGINEERING AND COMPUTER SCIENCE

(U) On the Mathematical Foundations of Nondifferentiable Optimization in Engineering Design.

MAR 87 72P

IDENTIFIERS: (U) PE81102F, WUAFOSR2308A2.

PERSONAL AUTHORS: Polak, E.

CONTRACT NO. F49620-79-C-0178, N00014-83-K-0602

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0819

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in SIAM Review, v29 n1 p21-88  
Mar 87.

ABSTRACT: (U) It is shown by example that a large class of engineering design problems can be transcribed into the form of a canonical optimization problem with inequality constraints involving max functions. Such problems are commonly referred to as semi-infinite optimization problems. The bulk of this paper is devoted to the development of a mathematical theory for the construction of first order nondifferentiable optimization algorithms, related to phase I - phase II methods of feasible directions, which solve these semi-finite optimization problems. The applicability of the theory is illustrated with examples that are relevant to engineering design. Keywords: Reprints; Algorithms.

DESCRIPTORS: (U) \*ENGINEERING, \*MATHEMATICS, \*OPTIMIZATION, \*APPLIED MATHEMATICS, ALGORITHMS, CONSTRUCTION, REPRINTS, THEORY.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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MASSACHUSETTS INST OF TECH CAMBRIDGE

IDENTIFIERS: (U) Ion conics, Polar cusps, Viking  
satellites, PE61102F, WJAFOSR3484A2.

(U) Local Transverse Ion Energization in and Near the  
Polar Cusp.

JAN 88

PERSONAL AUTHORS: Andre, Mats; Koskinen, Hannu; Matson,  
Liigo; Eriandson, Robert

CONTRACT NO. F49820-88-C-0128

PROJECT NO. 3483

TASK NO. A2

MONITOR: AFOSR  
TR-88-0443

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Geophysical Research Letters,  
v15 n1 p107-110 Jan 88.

ABSTRACT: (U) Ion conics are often observed in the  
dayside polar cusp region of the magnetosphere by the  
polar orbiting Viking satellite. These ion distributions  
may be locally heated perpendicularly to the ambient  
magnetic field to temperatures of about 100 eV. The  
conics are closely associated with increased electron  
fluxes but may occur equatorward of the region of ions  
injected from the magnetosheath. They are also closely  
related to waves with frequencies up to about 100 Hz. The  
wave electric field is directed mainly perpendicular to  
the ambient magnetic field and shows no clear structure  
near the ion gyrofrequencies or their harmonics.  
Observations of ion conics at 90 deg pitch angle and the  
related waves indicate that the waves may cause  
significant ion heating, especially of heavy ions.  
Keywords: Polar Cusp; Transverse Acceleration; Ion Conics;  
Viking Satellite; Reprints.

DESCRIPTORS: (U) \*MAGNETOSPHERE, \*PLASMA SHEATHS,  
ACCELERATION, DISTRIBUTION, ELECTRIC FIELDS, ELECTRON  
FLUX, HARMONICS, HEATING, HEAVY IONS, IONS, MAGNETIC  
FIELDS, POLAR REGIONS, REGIONS, REPRINTS, TRANSVERSE,  
WAVES.

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## DTIC REPORT BIBLIOGRAPHY

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BRISTOL UNIV (ENGLAND) DEPT OF INORGANIC CHEMISTRY

BAYLOR COLL OF MEDICINE HOUSTON TX

(U) The Carborane Group Eta5-C2B9H9Me2 as a Spectator and Non-Spectator Ligand in Di- and Tri-Metal Complex Chemistry: X-Ray Crystal Structures of (PPh4)(Co2M(mu3-CpH)(CO)3(eta5-C2B9H9Me2)), 1/2CH2Cl2, (NEt4)(FeW(mu-CCl3H3Me2-2,6)(CO)5(eta5-C2B9H9Me2)), and (IrW(mu-CCl3H4Me4)(CO)2(Pt3)2(eta5-C2B9H9Me2)).

87 5P

PERSONAL AUTHORS: Baumann, Franz-Erich; Howard, Judith A.; Musgrave, Rupert J.; Sherwood, Paul; Ruiz, Miguel A.

CONTRACT NO. AFOSR-86-0125

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-88-0623

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society Chemical Communications, p1881-1884 1987.

ABSTRACT: (U) It has been shown that salts XW(=CR)(CO)2(n5C2B9H9Me2) react with low-valent metal complexes to afford heteronuclear dimetal compounds with bridging alkylidyne groups. In some reactions the n5-C2B9H9Me2 ligand adopts a non-spectator role. We have now found that this behaviour dominates the chemistry of these species, and is strongly influenced by the different types of metal-metal bond formed, and by the character of the alkylidyne groups. As a consequence, many new di- and tri-metal complexes are accessible with potential for further synthesis. Keywords: Cobalt, Iron, Iridium, Tungsten, Carborane Complexes.

DESCRIPTORS: (U) \*METAL DETECTORS, \*CARBORANES, CHEMISTRY, COBALT, CRYSTAL STRUCTURE, IRIDIUM, IRON, METAL METAL BONDS, TUNGSTEN, X RAYS, SYNTHESIS(CHEMISTRY).

IDENTIFIERS: (U) PE81102F, WJAFOSR2303B2.

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(U) Noradrenergic Enhancement of Long-Term Potentiation at Mossy Fiber Synapses in the Hippocampus.

FEB 88

PERSONAL AUTHORS: Hopkings, William F.; Johnston, Daniel

REPORT NO. AFOSR-85-0178

PROJECT NO. 2312

TASK NO. A2

MONITOR: AFOSR  
TR-88-603

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Neurophysiology, V58 n2 p867-887 Feb 88.

ABSTRACT: (U) We have shown that norepinephrine (NE) enhances the magnitude, duration, and probability of induction of long-term potentiation (LTP) at mossy fiber synapses. This modulatory effect of NE on mossy fiber synaptic transmission appears to be dependent on the frequency of the stimulation, that is, NE exerts little or no effect at low rates of stimulation but enhances transmission following high-frequency trains of stimulation. This frequency- or activity-dependent action of NE stands in contrast to NE's reported effects at other excitatory synapses in the hippocampus. Our experiments support the conclusion that the modulation of LTP by NE is mediated by the activation of Beta-adrenoceptors, leading to a stimulation of cyclic AMP in the postsynaptic neuron. We also found that NE, Beta-adrenoceptor agonists, and 8-bromo-cyclic AMP enhanced voltage-dependent calcium conductance mechanisms. We present a working hypothesis that the enhancement of LTP by NE is through increased calcium channel activity, leading to greater calcium influx in the postsynaptic neuron. Keywords: Long-term potentiation; Calcium channels; Hippocampus; Norepinephrine; Mossy fibers; Nerve transmission; Reprints.

DESCRIPTORS: (U) \*HIPPOCAMPUS, \*LEVATYERENDOL, \*NERVE

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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TRANSMISSION, \*SYNAPSE, ADENOSINE PHOSPHATES, CALCIUM, CYCLIC COMPOUNDS, HYPOTHESES, LOW RATE, MODULATION, REPRINTS, STIMULATION(GENERAL), NERVE FIBERS, STIMULATION(PHYSIOLOGY).

SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

(U) Numerical Simulation of the Function of Scientific Instrumentation for Measuring the Speed of Electron Devices.

IDENTIFIERS: (U) \*Norepinephrine, Calcium channels, Mossy fibers, LTP(Long Term Potentiation), PEG1102F, WUAFOSR2312A2.

DESCRIPTIVE NOTE: Final rept. 1 Aug 87-31 Jan 88.

MAR 88 87P

PERSONAL AUTHORS: Osman, M. A.; Grubin, H. L.; Morrison, B. J.

REPORT NO. SRA-R87-910024-F

CONTRACT NO. F49620-87-C-0070

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-88-0449

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates: All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) The feasibility of using numerical simulation to assess the function of scientific instrumentation for measuring the speed of electron devices has been demonstrated by obtaining (1) the dc characteristics of the VHEMT and PHEMT, (2) transient response of the PHEMT to picosecond voltage pulses superimposed on the gate. The drift and diffusion and Poisson's equations were solved in two dimensions. The HEMT and PHEMT demonstrated transconductance of 94 and 375 mS/mm, respectively. The transient response is strongly dependent on the pulse shape and duration.

DESCRIPTORS: (U) \*ELECTRONIC EQUIPMENT, \*INSTRUMENTATION, \*PULSES, DIRECT CURRENT, DRIFT, EQUATIONS, MATHEMATICAL MODELS, NUMERICAL ANALYSIS, RESPONSE, SHAPE, TRANSIENTS, VELOCITY, VOLTAGE.

IDENTIFIERS: (U) PEG1102F, WUAFOSR3005A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 953

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12/3

AD-A194 953 CONTINUED

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF OPERATIONS RESEARCH

(U) Maximum Flow and Critical Outset as Descriptors of Multi-State Systems with Randomly Capacitated Components.

87

16P

PERSONAL AUTHORS: Fishman, George S.

CONTRACT NO. AFOSR-84-0140

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-88-0433

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Computers and Operations Research, v14 n6 p507-520 1987.

ABSTRACT: (U) We consider a network flow model in which are flow capacities are independent random variables with known probability distributions. As a result of this randomness, the maximum flow through this network is a random variable and, moreover, for a given flow level a probability distribution exists over the network flow constraints that are potentially responsible for this maximum flow. This paper describes a Monte Carlo sampling plan for efficiently estimating the probability that a particular constraint is the critical one and that the maximum flow lies within a specified interval. Motivation for using the Monte Carlo method arises from the computational infeasibility of computing this distribution exactly, especially as the size of the network increases. The proposed method makes use of a readily obtainable upper bound on the probability distribution of maximum flow to gain its computational advantage. A stochastic maximum flow model provides one approach to analyzing the reliability of a multi-state system with multistate components. For such a system one may know from measurement that the network flow is within a particular interval and, given this observation, would like to know how probable it is that a particular

flow constraint is the critical one in the system. The proposed method provides an answer to this and related queries. Keywords: Reprints; Confidence intervals.

DESCRIPTORS: (U) \*CONFIDENCE LIMITS, \*MONTE CARLO METHOD, \*STOCHASTIC PROCESSES, \*NETWORK FLOWS, INDEX TERMS, INTERROGATION, INTERVALS, MATHEMATICAL MODELS, MODELS, MOTIVATION, MULTIMODE, PLANNING, PROBABILITY DISTRIBUTION FUNCTIONS, RANDOM VARIABLES, RELIABILITY, REPRINTS, SAMPLING.

IDENTIFIERS: (U) Confidence intervals, PE61102F, WUAFOSR2304A5.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 942 7/5

AD-A194 941 7/2 20/13

CALIFORNIA INST OF TECH PASADENA DEPT OF CHEMISTRY

RENSELAER POLYTECHNIC INST TROY N Y DEPT OF CHEMISTRY

(U) Picosecond MPI (Multi-Photon Ionization) Mass Spectrometry of CH3I in the Process of Dissociation.

(U) Effect of Interfacial Phenomena on Contact Line Heat Transfer-III.

DEC 87

DESCRIPTIVE NOTE: Final rept. 1 Oct 84-30 Sep 87.

PERSONAL AUTHORS: Khundkar, Lutfur R.; Zewail, Ahmed H.

OCT 87 10P

CONTRACT NO. AFOSR-87-0071

PERSONAL AUTHORS: Wayner, Peter C., Jr

PROJECT NO. 2303

CONTRACT NO. AFOSR-84-0308

TASK NO. 83

PROJECT NO. 2308

MONITOR: AFOSR  
TR-88-0315

TASK NO. A1

MONITOR: AFOSR  
TR-88-0046

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v142 n5 p426-432, 18 Dec 87.

ABSTRACT: (U) Picosecond multiphoton ionization and time-of-flight mass spectrometry has been used to monitor the dissociation of methyl iodide excited to its A continuum. The measured signals show a rapid buildup when the probe laser is tuned to a resonance of free atomic iodine and a sharp at zero time delay when it is tuned off-resonance. Enhanced signal is also observed in the parent ion channel. These results illustrate the possible use of this technique for the probing of fragment species before they are completely separated from their partners in a half-collision process.

DESCRIPTORS: (U) \*PHOTOIONIZATION, \*PHOTODISSOCIATION, CHANNELS, FLIGHT, IODIDES, IONS, MASS SPECTROMETRY, METHYL RADICALS, PROBES, TIME, RESONANCE ABSORPTION, LASER BEAMS, LASER APPLICATIONS, REPRINTS.

IDENTIFIERS: (U) Picosecond time, Time of flight, PEG1102F, WJAFOSR2303B3.

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ABSTRACT: (U) The heat transfer characteristics of the contact line region of an evaporating thin liquid film were studied experimentally and theoretically. The effects of composition and temperature gradients on surface shear were analyzed and the results were successfully compared with previously reported experimental trends. The use of a constant vapor pressure boundary condition allowed the relative effects of surface tension, composition and temperature on fluid flow to be mapped. A small heat transfer cell was designed, built and used on the scanning stage of a scanning microphotometer. The unique use of a microphotometer allows the microscopic details to be measured. Keywords: Evaporation, Heat pipes, Capillarity, Distillation, Silicon carbide films, Thermistors, Interfacial tension.

DESCRIPTORS: (U) \*FILMS, \*HEAT PIPES, \*HEAT TRANSFER, \*SILICON CARBIDES, CAPILLARITY, CELLS, DISTILLATION, EVAPORATION, FLUID FLOW, INTERFACES, INTERFACIAL TENSION, LIQUIDS, MICROPHOTOMETERS, PATTERNS, REGIONS, SCANNING, SHEAR PROPERTIES, SURFACES, TEMPERATURE, TEMPERATURE GRADIENTS, THERMISTORS, THIN FILMS.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2308A1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 931 21/8 20/9

AD-A194 931 CONTINUED

ILLINOIS UNIV AT URBANA DEPT OF MECHANICAL AND INDUSTRIAL  
ENGINEERING

(U) Energy Conversion Measurements in Laser-Sustained  
Argon Plasmas for Application to Rocket Propulsion.

DESCRIPTORS: (U) \*ENERGY CONVERSION, \*PLASMAS(PHYSICS),  
\*ROCKET PROPULSION, ABSORPTION, BEHAVIOR, EFFICIENCY,  
ENERGY, GASES, GLOBAL, HIGH POWER, HIGH PRESSURE, INPUT,  
LASERS, MEASUREMENT, POWER, PRESSURE, PRODUCTION,  
PROPELLANTS, PROPULSION SYSTEMS, TEMPERATURE, THERMAL  
PROPERTIES.

DESCRIPTIVE NOTE: Final technical rept. 18 Feb 87-17 Feb  
88.

IDENTIFIERS: (U) PE81102F, WUAFOSR2308A1.

APR 88 88P

PERSONAL AUTHORS: Krier, Herman; Mazumder, Jyoti; Zerkle,  
David K.; Martogul, Ayhan; Schwartz, Scott

REPORT NO. UILU-ENG-88-4008

CONTRACT NO. AFOSR-87-0169

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0541

UNCLASSIFIED REPORT

ABSTRACT: (U) Laser Propulsion is the production of high  
specific impulse rocket thrust using a high power laser  
as a remote energy source. Specific impulses in excess of  
1000 seconds are achievable because propellant  
temperatures are very high and low molecular weight gases  
can be used. This report focuses on the energy conversion  
mechanisms of laser-sustained plasmas in flowing argon.  
The status of AFOSR sponsored experiments to determine  
thermal efficiency and global absorption is detailed. An  
improved testing facility has allowed plasma operating  
conditions never before possible. The results indicate  
that nearly all of the input laser power can be absorbed  
by a plasma. Plasmas at elevated gas pressure have been  
tested, and preliminary results presented. Optimal  
operating conditions have yet to be determined for the  
available laser powers and gas pressures. Further  
experimentation at very high argon gas velocities (> 20 m/  
s) must be performed in order to completely characterize  
plasma behavior. Keywords: Beamed energy propulsion,  
Laser plasma formation.

AD-A194 931

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## DYIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVI48A

AD-A194 867

7/4

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) The Emission of BrCl: Analysis of the D' Yields A' and E Yields B Transitions.

OCT 87

4P

PERSONAL AUTHORS: Chakraborty, Dilip K.; Tellinghuisen, Patricia C.; Tellinghuisen, Joel

CONTRACT NO. AFOSR-83-0110

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-88-0512

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v141 n1-2 p36-40, 30 Oct 87.

ABSTRACT: (U) When excited electrically or optically in the presence of inert buffer gases, all of the diatomic halogen molecules display strong UV-visible emission spectra. In some cases (e.g. I<sub>2</sub>, Br<sub>2</sub>, Cl<sub>2</sub>, ICl, IBr) the existence of these spectra has been known for 60 years or more. In others (F<sub>2</sub>, ClF, BrF, BrCl, IF), the spectra have begun to be characterized only recently, prompted in part by the interest in new electronic transition lasers. In the present work we have analyzed the D'-A' transition (2970-3185 Å) in BrCl, using Tesla discharge sources containing isotopically enriched samples of the source molecule. BrCl is one of those molecules where the emission spectrum has only recently been obtained with any definition. Our work represents the first quantitative interpretation of this spectrum, and it enlarges to 7 the number of halogen D'-A' systems which have been analyzed.

DESCRIPTORS: (U) \*DIATOMIC MOLECULES, \*HALOGENS, BUFFERS, ELECTRON TRANSITIONS, EMISSION SPECTRA, ENRICHMENT, GASES, INERT MATERIALS, LASERS, MOLECULES, SAMPLING, SOURCES, ULTRAVIOLET RADIATION, VISIBLE SPECTRA, YIELD.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B1.

AD-A194 867

AD-A194 868

7/4

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) The D' Yields A' Transition in the Emission Spectrum of IBr.

88

11P

PERSONAL AUTHORS: Guo, Baochuan; Tellinghuisen, Joel

CONTRACT NO. AFOSR-83-0110

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-88-0513

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular Spectroscopy, v127 p222-231 1988.

ABSTRACT: (U) Since at least the 1920s the diatomic halogen molecules have been known to exhibit prominent UV-visible emission spectra when excited by electrical and/or optical means in the presence of inert buffer gases. On the other hand the D'-A' systems are strong in emission, hence are amenable to the methods of conventional spectroscopy. Using Tesla discharge sources probably similar to those used by Filippov almost 60 years ago, workers in this laboratory have photographed and analyzed the D'-A' systems of I<sub>2</sub>(5, 13), Br<sub>2</sub>(5, 14), ICl(15), BrF(18), Cl<sub>2</sub>(17), and BrCl(18). Our only trick has been the use of isotopically pure halogens in our sources, coupled with a moderately high-resolution yet fast spectrometer. The present work continues this series with a vibrational analysis of the D'-A' system in IBr.

DESCRIPTORS: (U) \*DIATOMIC MOLECULES, \*HALOGENS, BUFFERS, EMISSION SPECTRA, GASES, INERT MATERIALS, PURITY, SOURCES, SPECTROMETERS, SPECTROSCOPY, ULTRAVIOLET RADIATION, VIBRATION, VISIBLE SPECTRA, YIELD, REPRINTS.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B1.

AD-A194 868

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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AD-A194 885 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

MOLECULAR STRUCTURE, SYMMETRY, REPRINTS.

(U) Study of Diacetylene Monomer and Polymer Monolayers  
Using Second- and Third-Harmonic Generation,

IDENTIFIERS: (U) \*Diacetylene monomers, \*Diacetylene  
polymers, Second harmonic generation, Third harmonic  
generation, PE81102F, WJAFOSR2303A3.

MAR 88 7P

PERSONAL AUTHORS: Berkovic, G.; Superfine, R.; Guyot-  
Stonnest, P.; Shen, Y. R.; Prasad, P. N.

REPORT NO. SUNY/AB/TR-16

CONTRACT NO. F49620-87-C-0042

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-88-0411

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Optical Society  
of America B, v5 n3 p666-673 Mar 88.

ABSTRACT: (U) Monolayers of several diacetylene monomers  
and polymers spread at the air-water interface have been  
studied using optical second-harmonic generation (SHG)  
and third-harmonic generation (THG). Owing to the  
centrosymmetry of the diacetylene core, SHG from these  
molecules arises mainly from their side groups. THG from  
a single monolayer of polydiacetylene is reported, to our  
knowledge, for the first time--the THG signal (in  
reflection) arising from the polydiacetylene monolayer is  
several times larger than that from the water subphase.  
THG was observed both when a polymer monolayer was spread  
directly and when a monomer monolayer was UV polymerized  
on the water surface. Values of the third-order  
nonlinearity of polydiacetylenes derived from these  
measurements are in agreement with earlier studies.  
Keywords: diacetylene monomer, polymer monolayers,  
harmonic generation.

DESCRIPTORS: (U) \*MONOMERS, \*POLYMERS, \*ACETYLENE, AIR  
WATER INTERACTIONS, HARMONIC GENERATORS, INTERFACES,  
LAYERS, MOLECULES, NONLINEAR SYSTEMS, SIDES, SURFACES,  
THIRD HARMONIC GENERATION, WATER, OPTICAL ANALYSIS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV146A

AD-A194 864 CONTINUED

AD-A194 864 20/4

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

PERTURBATIONS, PREDICTIONS, STABILITY, VECTOR ANALYSIS,  
VELOCITY, SUBSONIC FLOW, REPRINTS.

(U) Computation of Low-Speed Flow with Heat Addition.

IDENTIFIERS: (U) Pseudoacoustic waves, PEG1102F,  
WIAFDSR2308A1.

DESCRIPTIVE NOTE: Journal article,

JUN 87 10P

PERSONAL AUTHORS: Merk's, Charles L.; Choi, Yun-Ho

CONTRACT NO. AFOSR-82-0196

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0498

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in AIAA Jnl., V25 n6 p831-838  
Jun 87.

ABSTRACT: (U) A perturbation expansion is used to obtain a system of conservation laws for compressible flows that is valid at arbitrarily low Mach numbers. These equations are rendered hyperbolic by adding an artificial time derivative to the energy equation, thus introducing pseudo-acoustic waves with a speed the same order as the particle velocity. Traditional time-iterative schemes are shown to be effective in solving this system numerically. Stability calculations of the complete vector system indicate unconditional stability at all Mach numbers in the absence of gravity, but the source term introduced by buoyancy becomes destabilizing at Froude numbers below about 1. This instability is amplified by approximate factorization thus precluding solutions with gravity below this Mach number level. Computations of strong heat addition in low-Mach-number flow both with and without gravity confirm the stability predictions.

DESCRIPTORS: (U) \*COMPRESSIBLE FLOW, \*HEATING, ADDITION, AMPLIFICATION, BUOYANCY, COMPUTATIONS, CONSERVATION, ENERGY, EQUATIONS, EXPANSION, FLOW, FROUDE NUMBER, GRAVITY, HEAT, LOW VELOCITY, MACH NUMBER, PARTICLES,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 833 CONTINUED

MATERIALS RESEARCH SOCIETY PITTSBURGH PA

(U) Symposium on Better Ceramics Through Chemistry II Held  
in Palo Alto, California, on April 15-19, 1986.  
(Materials Research Society. Volume 73).

MOLECULES, ORGANOMETALLIC COMPOUNDS, PACKAGING, POLYMERS,  
POWDERS, PRECURSORS, PROCESSING, PYROLYSIS,  
SOLUTIONS(GENERAL), SYMPOSIA, SYNTHESIS(CHEMISTRY),  
CHEMICAL ENGINEERING.

IDENTIFIERS: (U) WUAF05R2303A3, PEG1102F.

DESCRIPTIVE NOTE: Final rept. 15 Apr 86-14 Apr 87.

88

PERSONAL AUTHORS: Brinker, C. J.; Clark, D. E.; Ulrich, D.  
R.

CONTRACT NO. AFOSR-88-0108

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-88-0687

UNCLASSIFIED REPORT

Availability: Materials Research Society, 9800 McKnight  
Rd. Suite 327, Pittsburgh, PA 15237 HC \$41.00 (No copies  
furnished by DTIC/NTIS).

ABSTRACT: (U) The main objective of the symposium was to  
improve upon the current state of the art in ceramic  
materials by exploring synthetic chemical routes, e.g.,  
solution processing and polymer pyrolysis as alternatives  
to conventional processing of natural minerals mixed from  
the earth. The symposium addressed the synthesis,  
structure, characterization, theory and applications of  
ceramic materials derived from molecular precursors. The  
technical content was organized to follow the evolution  
of the structure from its inception in solution through  
gelation, drying, heating and consolidation. Comparisons  
were made between the properties and structures of  
conventional and chemically derived ceramic materials.  
Keywords: Fractal, Organometallic precursors, Polymer  
pyrolysis, MD/MD calculations, Ceramic precursors, Powder  
synthesis, Films, Electronic packaging, Chemical  
synthesis.

DESCRIPTORS: (U) \*CERAMIC MATERIALS, DRYING, ELECTRONIC  
EQUIPMENT, EVOLUTION(GENERAL), GELATION, MINERALS,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A194 822 CONTINUED

AD-A194 822 20/5 7/4

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

\*Micelles, WUAFOSR230382, PES1102F.

(U) Magnetic Field and Isotope Dependence of the Reaction Rates of Micellized Triplet Radical Pairs.

DESCRIPTIVE NOTE: Rept. for 1984-1985.

88 8P

PERSONAL AUTHORS: Turro, Nicholas J.; Zimmt, Matthew B.; Gould, Ian R.

CONTRACT NO. AFOSR-84-0040

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-88-0518

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v92 n2 p433-437 1988.

ABSTRACT: (U) Nanosecond time resolved optical absorption studies of the isotopic dependence of the magnetic field effect on geminate triplet benzylic radical pair reaction dynamics in micelles of HDTCl are reported. The isotopic susceptibilities of the T sub + or - radical pair reaction rate constants in small (<50G) and intermediate (100-500 G) fields are substantially different. The magnitude and field dependences of the isotopic effects are discussed in terms of the mechanism of radical pair spin evolution (intersystem crossing) in the presence of magnetic fields. Keywords: geminate radicals; magnetic field effect; magnetic isotope effects; radical pairs; superoxide micelle; rate constants; Reprints.

DESCRIPTORS: (U) \*MAGNETIC FIELDS, \*COLLOIDS, \*ELECTRIC CHARGE, \*ABSORPTION SPECTRA, ABSORPTION CONSTANTS, DYNAMICS, EVOLUTION(GENERAL), MAGNETIC PROPERTIES, OPTICS, RATES, REACTION TIME, REPRINTS, SPINNING(MOTION), BENZYL RADICALS, ISOTOPE EFFECT.

IDENTIFIERS: (U) Geminate Radicals, Nanosecond Time.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A194 821 CONTINUED

HA/STACK OBSERVATORY WESTFORD MA

AD-A194 821 17/9 4/1

(U) Radar Observations of the Onset of Current Driven  
Instabilities in the Topside Ionosphere,  
IDENTIFIERS: (U) PEG1102F, WUAFOSR2310A2

FEB 88

PERSONAL AUTHORS: Foster, J. C.; Pozo, C. del; Groves, K.

CONTRACT NO. AFOSR-88-0023, NSF-ATM84-19117

PROJECT NO. 2310

TASK NO. A2

MONITOR: AFOSR  
TR-88-0511

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Geophysical Research Letters,  
v15 n2 p160-163 Feb 88.

ABSTRACT: (U) Milestone will radar spectra exhibit pronounced spectral asymmetries in the presence of field-aligned currents in the topside ionosphere. The enhanced, often intense, returns associated with the current-driven growth of the ion acoustic mode exhibit the characteristics of hard-target backscatter suggesting that many satellite echoes observed by UHF radars at high latitudes might be caused by this mechanism. A large current density ( $>100 \text{ microamp/sq.m}$ ) is calculated for the conditions observed, consistent with that seen in intense earthward-directed current filaments. Our observations indicate that the ion acoustic mode grows toward instability with increasing altitude. Backscatter observed from the unstable region at higher altitudes is characteristically at the ion plasma frequency consistent with the unstable growth of the acoustic mode for large ratios of electron to ion temperature. (Reprints).

DESCRIPTORS: (U) \*ACOUSTICS, \*BACKSCATTERING, \*ECHOES, \*IONOSPHERE, \*IONS, \*PLASMAS(PHYSICS), \*RADAR, ALIGNMENT, ARTIFICIAL SATELLITES, ASYMMETRY, CURRENT DENSITY, CURRENTS, ELECTRONS, FREQUENCY, GROWTH(GENERAL), HARDENING, HIGH ALTITUDE, HIGH LATITUDES, RATIOS, REGIONS, REPRINTS, SPECTRA, STABILITY, TARGETS, TEMPERATURE, ULTRAHIGH FREQUENCY.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 820 CONTINUED

AD-A194 820 6/4 5/8

NEW YORK UNIV NY NEUROMAGNETISM LAB

STEADY STATE.

(U) Source Localization of Long-Latency Auditory Evoked Magnetic Fields in Human Temporal Cortex.

IDENTIFIERS: (U) \*Auditory evoked magnetic fields, Neuromagnetic fields, Evoked potential, Neurophysiology, PE81102F, WUAFOSR2313A4.

DESCRIPTIVE NOTE: Journal article,

87 12P

PERSONAL AUTHORS: Williamson, Samuel J.; Arthur, Deborah L.; Flynn, Edward R.

CONTRACT NO. F49620-85-K-0004, W-7405-eng-36

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-88-0510

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Current Trends in Event-Related Potential Research, p429-439 1987.

ABSTRACT: (U) Systematic measurements over the scalp of the auditory-evoked magnetic field following a long tone burst have been completed for four normal subjects with tones of 250 and 2500 Hz. The locations of neural activity producing the magnetic transient components P1m (with 45 ms latency), N1m (100ms), P2m (200ms), and - for the first time - the steady field component were determined by representing each source as an equivalent current dipole. All four components have sources that lie within or very near to auditory cortex. The sources of P1m and P2m are separated from the source of N1m, but the source of the steady field cannot be distinguished from that of N1m. The source of P1m shows a significant frequency dependence for its position for individual subjects but no systematic change of position across the four subjects. Keywords: Auditory, Neuromagnetic field, Brain activity, Reprints.

DESCRIPTORS: (U) \*CEREBRAL CORTEX, \*AUDITORY PERCEPTION, \*ELECTROENCEPHALOGRAPHY, \*BIOMAGNETISM, BRAIN, FREQUENCY, HEAD(ANATOMY), HEARING, MAGNETIC FIELDS, MEASUREMENT, NEURAL NETS, POSITION(LOCATION), REPRINTS, SKIN(ANATOMY).

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

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AD-A194 818

7/3

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
CHEMISTRY

(U) Feedback Linearization Families for Nonlinear Systems.

(U) Ring-Opening Polymerization of Methylsilane- and  
Methylsiloxane-Substituted Cyclotriphosphazenes.

DESCRIPTIVE NOTE: Journal article.

88

11P

OCT 87

8P

PERSONAL AUTHORS: Rugh, William J.

PERSONAL AUTHORS: Allcock, Harry R.; Brennan, David J.;  
Grasskamp, James M.

CONTRACT NO. AFOSR-87-0101

CONTRACT NO. AFOSR-84-0147

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A1

TASK NO. B2

MONITOR: AFOSR

MONITOR: AFOSR

TR-88-0438

TR-88-0500

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Transactions on  
Automatic Control, VAC-32 n10 p935-940 Oct 87.

SUPPLEMENTARY NOTE: Pub. in Macromolecules, v21 n1 p1-10  
1988.

ABSTRACT: (U) Characterizations are developed for  
parameterized, linear, dynamic feedback control laws that  
can arise when linearizing a nonlinear, dynamic feedback  
control law for a specified nonlinear system about a  
family of constant operating points. Such  
characterizations are important in applying the recently-  
developed extended linearization design approach to  
various types of control problems. To illustrate, the  
input-output decoupling problem is considered. Keywords:  
Nonlinear Control Systems; Control Theory.

ABSTRACT: (U) Poly(organophosphazenes) and the  
poly(organosiloxanes) constitute two of the main classes  
of inorganic backbone polymers. Poly(organosiloxanes)  
have an inherently flexible backbone and a hydrophobicity  
and thermooxidative stability associated with the  
presence of alkyl or aryl groups attached to silicon  
atoms. The properties of poly(organophosphazenes) also  
result from a high backbone flexibility, mediated by the  
size and polarity of the side groups attached to the  
backbone. One of our objectives is to prepare  
macromolecules that combine some of the characteristics  
of poly(organosiloxanes) and poly(organophosphazenes).  
Three methods can be envisaged for the preparation of  
hybrid macromolecules that contain both organosilicon and  
organophosphazene units. The first involves  
copolymerization reactions between cyclotriphosphazene  
and cyclosiloxane species to yield main-chain hybrid  
structures. Reprints.

DESCRIPTORS: (U) \*NONLINEAR SYSTEMS, \*CLOSED LOOP  
SYSTEMS, \*FEEDBACK, CONTROL SYSTEMS, CONTROL THEORY,  
REPRINTS.

IDENTIFIERS: (U) PER1102F, WUAFOSR2304A1.

DESCRIPTORS: (U) \*ORGANIC COMPOUNDS, \*PHOSPHAZENE,  
\*POLYMERS, \*SILICON COMPOUNDS, \*SILANES, ARYL RADICALS,  
ATOMS, CHEMICAL REACTIONS, COPOLYMERIZATION, HYBRID  
SYSTEMS, HYDROPHOBIC PROPERTIES, INORGANIC POLYMERS.

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DTIC REPORT BIBLIOGRAPHY

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MACROMOLECULES, OXIDATION, PREPARATION, REPRINTS, SIDES,  
SILICON, STABILITY, THERMAL STABILITY.

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
CHEMISTRY

IDENTIFIERS: (U) \*Phosphayenes/cyclatri, WUAFOSR2303B2,  
PE81102F.

(U) Organosilicon Derivatives of Cyclic and High Polymeric  
Phosphazenes,

88 10P

PERSONAL AUTHORS: Allcock, Harry R.; Brennan, David J.

CONTRACT NO. AFOSR-84-0147

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-88-0499

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organometallic  
Chemistry, v341 p231-239 1988.

ABSTRACT: (U) A new class of compounds is reviewed, the  
members of which are hybrids of organosilicon and  
organophosphazene species. They are synthesized either by  
the reaction of organosilicon halides with organocopper-  
phosphazene intermediates, or by the interaction of  
organosilyl or organosiloxy Grignard reagents with  
chlorophosphazenes. Several of the cyclic trimeric  
phosphazenes prepared in this way were polymerized by  
heating to give linear high polymeric phosphazenes with  
organosilicon side groups. Keywords: Polymers,  
Phosphazenes, Organometallic, Synthesis, Silicon,  
Reprints.

DESCRIPTORS: (U) \*ORGANIC COMPOUNDS, \*PHOSPHAZENE,  
\*POLYMERS, \*SILICON COMPOUNDS, GRIGNARD REAGENTS, HALIDES,  
HYBRID SYSTEMS, REPRINTS, RESPONSE, SIDES, SILICON,  
SYNTHESIS(CHEMISTRY).

IDENTIFIERS: (U) WUAFOSR2303B2, PE81102F.

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## UNCLASSIFIED

DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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AD-A184 803 17/9

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

CALIFORNIA INST OF TECH PASADENA DEPT OF ELECTRICAL ENGINEERING

(U) Effects of Organic Side Group Structures on the Properties of Poly(organophosphazenes).

88 13P

(U) Acoustooptic Processing of Two Dimensional Signals Using Temporal and Spatial Integration.

DESCRIPTIVE NOTE: Annual rept. 1 Mar 87-28 Feb 88,

PERSONAL AUTHORS: Allcock, Harry R.; Connolly, Mark S.; Sikko, John T.; Al-Shall, Saman

FEB 88 41P

PERSONAL AUTHORS: Psaltis, Demetri; Brady, Dave; Hudson, Scott; Mok, Fai; Yu, Jeff

CONTRACT NO. AFOSR-84-0147

PROJECT NO. 2303

CONTRACT NO. AFOSR-85-0332

TASK NO. B2

PROJECT NO. 2305

MONITOR: AFOSR TR-88-0501

MONITOR: AFOSR TR-88-0410

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Macromolecules, v21 n2 p323-334 1988.

ABSTRACT: (U) Methods are reported for the synthesis of three new classes of poly(organophosphazenes) via the substitution reactions of poly(dichlorophosphazene). The first class consists of single-substituent polymers with aromatic rings separated from the main chain by methyleneoxy-spacer groups. The second and third classes comprise mixed-substituent polymers that contain aryloxy and aryl ester or aryl Schiff's base side groups. The variations in glass transition temperature with changes in side groups are discussed and are compared with the values for various alkoxy and alkoxy ether side group systems. The absence of liquid crystallinity for most of the derivatives was ascribed to the restricted rotational freedom of the side groups and, for the mixed-substituent polymers, to a lack of stereoregularity. Reprints.

DESCRIPTORS: (U) \*PHOSPHAZENE, \*ORGANIC COMPOUNDS, AROMATIC COMPOUNDS, CHAINS, CRYSTALS, GLASS, LIQUIDS, REPRINTS, RINGS, SIDES, STRUCTURES, SYNTHESIS, TRANSITION TEMPERATURE.

IDENTIFIERS: (U) WJAFOSR2303B2, PEG1102F.

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AD-A194 803

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## UNCLASSIFIED REPORT

ABSTRACT: (U) The goal of this project is the development of optical signal processing architectures and techniques that are suitable for processing information in two dimensions. We have applied our methods to synthetic aperture radar (SAR), image recognition, two dimensional spectrum analysis of one dimensional signals and adaptive phased arrays. In previous years we have developed several specific acoustooptic architecture in each category. In this report we describe our recent results in the areas of radar imaging, image correlation, and integrated optical signal processing.

DESCRIPTORS: (U) \*PHASED ARRAYS, \*RADAR IMAGES, \*SIGNAL PROCESSING, \*SYNTHETIC APERTURE RADAR, ACOUSTOOPTICS, ADAPTIVE SYSTEMS, ARCHITECTURE, CORRELATION, IMAGES, INFORMATION PROCESSING, INTEGRATED SYSTEMS, ONE DIMENSIONAL, OPTICAL PROCESSING, PROCESSING, RECOGNITION, SIGNALS, SPECTRUM ANALYSIS, TWO DIMENSIONAL.

IDENTIFIERS: (U) PEG112F, WJAFOSR2305B1.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

(U) The Matching Methodology: Some Statistical Properties.

DESCRIPTIVE NOTE: Interim rept. 1 Jul 84-30 Jun 88.

JUN 88 183P

PERSONAL AUTHORS: Goel, Prem K.; Ramalingam, T.

REPORT NO. OSURF-TR-333

CONTRACT NO. AFOSR-84-0182, NSF-DMS84-00887

PROJECT NO. 2304

TASK NO. K3

MONITOR: AFOSR  
TR-88-0447

UNCLASSIFIED REPORT

**ABSTRACT:** (U) Matching is defined as the methodology of merging micro-data files to create larger files of data. Matching is often done to extract statistical information which cannot be obtained from the individual files that are incomplete. Current federal statistical practice involving multivariate file-merging techniques is typically not based on a formal statistical theory. In view of this situation, a survey on matching is given. All known models for matching are presented under a unified framework, which consists of three situations involving the same or similar individuals. The properties of a maximum likelihood strategy to match files of data involving the same individuals are derived via ranks and order-statistics from bivariate populations. In addition, the properties of this strategy have been examined with respect to a more reasonable criterion called epsilon-correct matching. Asymptotic results for such situation, including the Poisson approximation for the distribution of the number of correct matches, and convergence in probability of the average number of epsilon-correct matches, have been derived. Small-sample properties, like the monotone behavior of the expected number of matches with respect to the dependence of parameters of the underlying models, have been proved. Two matching strategies due to Kadane (1978) and one strategy due to

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Sims (1978) for merging files of data on similar individuals are discussed. These strategies are evaluated via a Monte-Carlo study of matching models involving trivariate normal distributions. Keywords: Monte Carlo method; trivariate normal distributions.

DESCRIPTORS: (U) \*FILES(RECORDS), \*MATCHING, \*STATISTICAL PROCESSES, \*STATISTICAL DATA, BIVARIATE ANALYSIS, MAXIMUM LIKELIHOOD ESTIMATION, METHODOLOGY, MODELS, MONTE CARLO METHOD, POISSON DENSITY FUNCTIONS, POPULATION, SAMPLING, STATISTICS, STRATEGY, SURVEYS, THEORY, DATA MANAGEMENT.

IDENTIFIERS: (U) PE61102F, WJAFOSR2304K3, LPN-OSURF, 718336.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A194 790 CONTINUED

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

Illumination conditions.

(U) Neural Dynamics of 1-D and 2-D Brightness Perception:  
A Unified Model of Classical and Recent Phenomena.

88

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*NEURAL NETS,  
\*VISUAL PERCEPTION, \*SPATIAL DISTRIBUTION, BOUNDARIES,  
CELLS(BIOLOGY), COMPARTMENTS, VISUAL CORTEX, DIFFUSION,  
DISTRIBUTION, ILLUMINATION, INTERACTIONS, LUMINANCE,  
MODELS, NETWORKS, NONLINEAR SYSTEMS, NONUNIFORM, OUTPUT,  
PROFILES, REPRINTS, RESPONSE, SEGMENTED, SIGNALS,  
SIMULATION, STIMULI, TRIGGER CIRCUITS,  
PERCEPTION(PSYCHOLOGY), IMAGE PROCESSING, ONE DIMENSIONAL,  
TWO DIMENSIONAL.

PERSONAL AUTHORS: Grossberg, Stephen; Todorovic, Dejan

CONTRACT NO. F49620-87-C-0018, DAAG29-85-K-0095

PROJECT NO. 2304

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1.

TASK NO. A1

MONITOR: AFOSR, ARD

TR-88-0390, 22399, 15-WA

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Perception and Psychophysics,  
v43 p241-277 1988.

ABSTRACT: (U) Computer simulations of a neural network model of 1-D and 2-D brightness phenomena are presented. The simulations indicate how configurational image properties trigger interactions among spatially organized contrastive, boundary segmentation, and filling-in process to generate emergent percepts. They provide the first unified mechanistic explanation of this set of phenomena, a number of which have received no previous mechanistic explanation. Network interactions between a Boundary Contour (BC) System and a Feature Contour (FC) System comprise the model. The BC System consists of a hierarchy of contrast-sensitive and orientationally tuned interactions, leading to a boundary segmentation. On and off geniculate cells and simple and complex cortical cells are modeled. Output signals from the BC System segmentation generate compartmental boundaries within the FC System. Contrast-sensitive inputs to the FC System generate a lateral filling-in of activation within FC System compartments. The filling-in process is defined by a nonlinear diffusion mechanism. Simulated phenomena include network responses to stimulus distributions that involve combinations of luminance steps, gradients, cusps, and corners of various sizes. These images include impossible staircases, bull's-eyes, nested combinations of luminance profiles, and images viewed under nonuniform

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 789 7/3

AD-A194 787 21/2

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

FLOW RESEARCH INC KENT WA

(U) Modification of Photochemical Reactivity by Cyclodextrin Complexation: A Remarkable Effect on the Photobehavior of  $\alpha$ -Alkylalkylidibenzyl Ketones,

(U) Flame Extinction in a Temporally Developing Mixing Layer,

87

6P

86

12P

PERSONAL AUTHORS: Rao, B. N.; Syamala, M. S.; Turro, N. J.; Ramamurthy, V.

PERSONAL AUTHORS: Givi, P.; Jou, W. -H.; Metcalfe, R. W.

REPORT NO. FLOW-TP-147

CONTRACT NO. AFOSR-84-0040

CONTRACT NO. F49820-85-C-0067

PROJECT NO. 2303

PROJECT NO. 2308

TASK NO. B2

TASK NO. A2

MONITOR: AFOSR  
TR-88-0515

MONITOR: AFOSR  
TR-88-0395

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v52 n25 p5517-5521 1987.

SUPPLEMENTARY NOTE: Pub. in Symposium (International) on Combustion/The Combustion Inst. (21st), p1251-1261 1986.

ABSTRACT: (U) The Norrish Type I and Type II reactions of cyclodextrin- included  $\alpha$ -alkylidibenzyl ketones have been investigated in the aqueous solution and in the solid state. The photolysis of solid cyclodextrin complexes led to a single product, diphenylethane (AB), and that of complexes in the aqueous solution resulted in a product arising from the rearrangement of  $\alpha$ -alkylidibenzyl ketones. Conformational and supercage effects are proposed to be responsible for the dramatic alteration observed in the above photobehavior. The difference in the product distribution between solid and solution complexes is attributed to the differences in the restriction imposed by the host on the translational motions of the geminate radical pair. Keywords: Cyclodextrins, Supercage effects, Geminate radical pairs, Dibenzyl ketones, Norrish reactions.

DESCRIPTORS: (U) \*PHOTOLYSIS, \*BENZYL RADICALS, \*KETONES, DEXTRINS, DISTRIBUTION, PHOTOCHEMICAL REACTIONS, SOLUTIONS(GENERAL), SOLUTIONS(MIXTURES), WATER.

IDENTIFIERS: (U) Ketones/alkylidibenzyl, PE81102F, WUAFOSR230382.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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TIME, REPRINTS, SCALAR FUNCTIONS, SHEAR PROPERTIES, TWO  
STOICHIOMETRY, STRUCTURAL PROPERTIES, TEMPERATURE, TWO  
DIMENSIONAL, TIME DEPENDENCE, CHEMICAL REACTIONS, DENSITY,  
DISSIPATION, REACTION KINETICS.

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF ELECTRICAL  
ENGINEERING AND COMPUTER S CIENCE  
(U) Kth -Order Extended Linearization.

IDENTIFIERS: (U) Mixing layers(Flames), Reacting flow,  
Diffusion flames, PE81102F, WJAFOSR2308A2.

DESCRIPTIVE NOTE: Rept. for 1 Mar 87-28 Feb 88,

MAR 88 7P

PERSONAL AUTHORS: Wang, Jianliang; Rugh, Wilson J.

CONTRACT NO. AFOSR-87-0101

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0435

UNCLASSIFIED REPORT

ABSTRACT: (U) For a given nonlinear system, consider the design of a nonlinear control law such that the following properties hold. First, as in the extended linearization method, linearizations of the closed-loop system about constant operating points of the closed-loop system achieve specified, linear design objectives. Second, the Taylor series expansion of the closed-loop state equation about any constant operating point is such that terms of order 2, 3, ..., k are zero, or at least are minimized in a certain sense. Conditions under which this can be achieved, while simple to state, are restrictive.  
Keywords: Nonlinear Control Systems; Control Theory.

DESCRIPTORS: (U) \*CONTROL THEORY, CLOSED LOOP SYSTEMS, CONTROL SYSTEMS, EQUATIONS OF STATE, EXPANSION, NONLINEAR SYSTEMS, TAYLORS SERIES, REPRINTS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A1.

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## DTIC REPORT BIBLIOGRAPHY

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AD-A194 780 12/5 12/3

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

OHIO STATE UNIV COLUMBUS DEPT OF STATISTICS

(U) Reactions of XeF<sub>2</sub> with Thermally Grown SiO<sub>2</sub>.

(U) Software for Bayesian Analysis: Current Status and Additional Needs.

88 14P

DESCRIPTIVE NOTE: Technical rept.,

PERSONAL AUTHORS: Joyce, S.; Langan, J. G.; Steinfeld, J. I.

MAY 87 23P

CONTRACT NO. F49620-88-C-0003, F19828-88-C-0139

PERSONAL AUTHORS: Goel, Prem K.

PROJECT NO. 2303

REPORT NO. TR-368

TASK NO. B1

CONTRACT NO. AFOSR-84-0162

MONITOR: AFOSR  
TR-88-517

PROJECT NO. 2304

TASK NO. K3

## UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-88-0479

SUPPLEMENTARY NOTE: Pub. in Surface Science, v195 p270-282 1988.

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The reactions of XeF<sub>2</sub> on thermally grown SiO<sub>2</sub> have been studied. XeF<sub>2</sub> does not readily undergo a dissociative chemisorption on these surfaces. Damaging the oxide with 500 eV argon ions enhances this process significantly through the creation of active sites. XPS analysis of the resulting adlayer, together with molecular-orbital model calculations, reveal the presence of fluorine bound to both silicon and oxygen. The oxyfluoride species can be removed from the surface by annealing the crystal to 200 C. Keywords: Silicon oxide, Xenon fluoride, Surface chemistry, Reactive etching, Reprints.

**DESCRIPTORS:** (U) \*FLUORIDES, \*SILICON, \*XENON, \*CHEMICAL REACTIONS, ANNEALING, ARGON, CHEMISORPTION, DISSOCIATION, ETCHING, FLUORINE, IONS, MODELS, MOLECULAR ORBITALS, OXIDES, OXYGEN, REACTIVITIES, REPRINTS, SILICON COMPOUNDS, SITES, SURFACE CHEMISTRY, SURFACES, SPUTTERING, SEMICONDUCTOR DEVICES, MOLECULAR ORBITALS, ANNEALING, ARGON, CHEMISORPTION, DISSOCIATION, ETCHING, FLUORIDES, FLUORINE, IONS, MODELS, MOLECULAR ORBITALS, OXIDES, OXYGEN, REACTIVITIES, REPRINTS, SILICON, SILICON COMPOUNDS, SITES, SURFACE CHEMISTRY, SURFACES, XENON.

IDENTIFIERS: (U) Oxyfluorides, PE81102F, WUAFOSR2303B1.

AD-A194 781

**ABSTRACT:** (U) This document makes an attempt to provide comprehensive information about the existing software for data analysis within the Bayesian paradigm. The paucity of programs seems to indicate that the Bayesian software available for widespread use is still in its infancy. We have a long way to go before a general purpose Bayesian Statistical Analysis package is made available. Alternatives for reaching this goal quickly are presented in the concluding section. Keywords: Bayesian software; ADA(Computer Assisted Data Analysis Monitor); BRAP(Bayesian Regression Analysis Program).

**DESCRIPTORS:** (U) \*BAYES THEOREM, \*COMPUTER PROGRAMS, \*STATISTICAL ANALYSIS, DATA PROCESSING.

**IDENTIFIERS:** (U) CADA(Computer Assisted Data Analysis Monitor), BRAP(Bayesian Regression Analysis Program), PE81102F, WUAFOSR2304K3.

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AD-A194 775 CONTINUED

CINCINNATI UNIV OH DEPT OF AEROSPACE ENGINEERING AND  
APPLIED MECHANICS

IDENTIFIERS: (U) Flow Reattachment, Flow control, Active  
control, Elliptical cylinders, PE81102F, WUAFOSR2307A1.

(U) Direct-Solution Techniques for Viscous Flows and Their  
Control.

DESCRIPTIVE NOTE: Annual Rept. 15 Oct 88-14 Oct 87,

JAN 88 40P

PERSONAL AUTHORS: Ghia, Kurti M.; Ghia, Umila

REPORT NO. AFL-88-1-73

CONTRACT NO. AFOSR-87-0074

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-88-0483

UNCLASSIFIED REPORT

ABSTRACT: (U) Two main areas of research were pursued.  
In the area of active control of separated flows, the  
oscillating flap mechanism is examined by considering a  
backstep channel with an oscillating flap located in the  
primary reattachment region. A procedure has been  
developed for generating clustered conformal coordinates  
for this geometry with arbitrary orientations of the flap.  
Considerable effort was directed towards making the  
computational procedure efficient, so as to make it  
useful for repeated application needed for this  
temporally deforming geometry. The corresponding flow  
solution is presently being developed. Flow past an  
elliptic cylinder is studied with the objective of  
examining flow control via an unsteady free stream.

DESCRIPTORS: (U) \*VISCOUS FLOW, \*VORTICES, \*UNSTEADY  
FLOW, CLUSTERING, COMPUTATIONS, CONFORMAL STRUCTURES,  
CONTROL, COORDINATES, CYLINDRICAL BODIES, DEFORMATION,  
ELLIPSES, FLAPS(CONTROL SURFACES), FLOW, FLOW SEPARATION,  
GEOMETRY, ORIENTATION(DIRECTION), OSCILLATION,  
SOLUTIONS(GENERAL), VELOCITY, CONFORMAL MAPPING, THREE  
DIMENSIONAL FLOW, ATTACHMENT, DATA BASES, DATA MANAGEMENT,  
INPUT OUTPUT PROCESSING.

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AD-A194 782

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## FLORIDA UNIV GAINESVILLE

(U) Proceedings of the International Symposium on Quantum Chemistry Solid-State Theory and Computational Methods (21st) Held in Marineland, Florida on 12-21 March 1987. Annual Sanibel Symposia (27th). Part 2. International Journal of Quantum Chemistry.

DESCRIPTIVE NOTE: Final rept.,

MAR 87

PERSONAL AUTHORS: Lowdin, Per-Olov

CONTRACT NO. AFOSR-87-0111, N00014-87-G-0102

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-88-0886

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also part 1, AD-A194 735.

ABSTRACT: (U) The 27th Annual Sanibel Symposia, which included the 14th meeting of the Symposium on Quantum Biology and Quantum Pharmacology, was held on March 12-21, 1987 at the University of Florida Marine Biology Laboratory at Marineland on the Atlantic Coast of Florida. These proceedings comprise contributions of both invited talks and poster presentations. Submitted papers were subjected to the ordinary refereeing procedures of the International Journal of Quantum Chemistry. Although some of the papers fall outside the ordinary scope of quantum chemistry they reflect the content of the symposium.

DESCRIPTORS: (U) \*QUANTUM THEORY, \*SOLID STATE PHYSICS, ATLANTIC OCEAN, COASTAL REGIONS, FLORIDA, INTERNATIONAL, LABORATORIES, MARINE BIOLOGY, MOLECULAR BIOLOGY, NUMERICAL METHODS AND PROCEDURES, PHARMACOLOGY, QUANTUM CHEMISTRY, SYMPOSIA.

IDENTIFIERS: (U) PE81102F, WJAFOSR230383.

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## OPTICAL SOCIETY OF AMERICA WASHINGTON D C

(U) Topical Meeting on Machine Vision. Technical Digest Series. Volume 12. Held in Incline Village, Nevada on March 18-20 1987.

DESCRIPTIVE NOTE: Final rept. 15 Mar 87-31 Mar 88.

MAR 88

184P

PERSONAL AUTHORS: Quinn, J. W.

CONTRACT NO. AFOSR-87-0208

PROJECT NO. 2305

TASK NO. B4

MONITOR: AFOSR  
TR-88-0484

## UNCLASSIFIED REPORT

ABSTRACT: (U) This meeting provided a forum for both invited and contributed papers on machine vision. Machine vision is important in two general areas: inspection and assembly. In the area of inspection we have measurement problems with typical dimensions ranging from submicrometers to meters, and problems of defect detection and characterization. Assembly tasks involve object sensing, recognition tracking, and mating of parts. Machine vision, like its human counterpart, comprises two distinct but interrelated components: data acquisition and data analysis. Most research in machine vision concentrates on one or the other of these components. This meeting brought together people working in these two areas to foster interactions between the sensor development and the algorithm development communities. Keywords: Reports; Abstracts.

DESCRIPTORS: (U) \*OPTICAL PROCESSING, \*VISUAL INSPECTION, DATA ACQUISITION, DATA PROCESSING, DETECTION, DETECTORS, MEASUREMENT, NEVADA, PARTS, RECOGNITION, TRACKING, OPTICAL IMAGES, ASSEMBLY.

IDENTIFIERS: (U) \*Machine vision, WJAFOSR230584, PE81102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A194 761 22/5

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF MECHANICAL AND  
AEROSPACE ENGINEERING

(U) Proceedings of the AFOSR Forum on Space Structures  
(5th) Held in Monterey, California on August 20-21,  
1987.

DESCRIPTIVE NOTE: Technical rept..

DEC 87 92P

PERSONAL AUTHORS: Pilkey, Walter D.; Kosut, Robert L.

REPORT NO. UVA/525673/NAE88/102

CONTRACT NO. F49620-88-K-0009

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-88-0477

UNCLASSIFIED REPORT

ABSTRACT: (U) The topics covered include modeling of spacecraft, wave propagation in large space structures, multiflexible body dynamic simulation, adaptive structures, electromechanical actuators for controlling flexible structures, system identification of suboptimal control parameters, integrated structural analysis and control, active control of elastic wave motion in structural networks, adaptive control of large space structures, analysis of performance degradation, optimal projection equations for fixed-order dynamic compensation, decentralized/relegated control for large space structures, Frobenius-Hankel norm framework for disturbance rejection and low order decentralized controller design, a method for truss structure vibration control, and robust eigenstructure assignment by a projection method. Keywords: Large space structures; Complex flexible structures; Modeling.

DESCRIPTORS: (U) \*FLEXIBLE STRUCTURES, \*SPACE STATIONS, \*FLEXURAL PROPERTIES, ADAPTIVE CONTROL SYSTEMS, ADAPTIVE SYSTEMS, CONTROL, DEGRADATION, ELASTIC WAVES, EQUATIONS, IDENTIFICATION, INTEGRATED SYSTEMS, MODELS, MOTION,

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NETWORKS, OPTIMIZATION, PARAMETERS, REJECTION, SPACECRAFT,  
STRUCTURAL ANALYSIS, STRUCTURAL PROPERTIES, STRUCTURES,  
SYMPOSIA, SYNCHROS, TRUSSES, VIBRATION, WAVE PROPAGATION,  
RECURSIVE FUNCTIONS.

IDENTIFIERS: (U) Frobenius-Hankel functions,  
ISAAC(Integral Structural Analysis and Control),  
WUAFOSR2302B1, PE81102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A194 755 CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) Electrical and Thermal Modulation of Protein Synthesis  
in Cartilage: A Model for Field Effects on Biological  
Tissues.

chondrocyte metabolism. These results may have important  
implications regarding clinical applications of fields to  
alter growth and remodeling.

DESCRIPTORS: (U) \*BIOSYNTHESIS, \*CARTILAGE, \*PROTEINS,  
CLINICAL MEDICINE, DENSITY, ELECTRICAL PROPERTIES,  
FUNCTIONS, INTERACTIONS, MODELS, MODULATION, PHYSIOLOGY,  
THERMAL PROPERTIES, TISSUES(BIOLOGY), EXPOSURE(PHYSIOLOGY),  
THERMAL STRESSES, PHYSIOLOGICAL EFFECTS,  
RESPONSE(BIOLOGY).

DESCRIPTIVE NOTE: Final rept. 1 Aug 85-15 Jan 88.

JAN 88 297P

PERSONAL AUTHORS: Grodzinsky, Alan J.; MacGinitie, Laura  
A.

IDENTIFIERS: (U) PE81102F, WJAFOSR2312AB.

CONTRACT NO. AFOSR-85-0274

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-88-0456

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Doctoral thesis.

ABSTRACT: (U) The possibility that applied electric  
fields may alter physiological function has been examined  
using articular cartilage as an experimental model. Field-  
induced changes in stress protein and total protein  
synthesis have been quantified. The amplitudes and  
frequencies of the applied fields were motivated by the  
values associated with naturally occurring fields, and by  
some models of possible mechanisms of interaction.  
Cartilage specimens were exposed to current densities up  
to 30 millamp/cm squared, at frequencies of 1, 10, and  
100 Hz and 1 and 10 kHz for 12 hours in a chamber filled  
with media containing 35S-methionine. Unstimulated  
controls were incubated and labelled in an identical  
specimen chamber in the same incubator. Stress protein  
synthesis was assessed by examination of gel fluorographs.  
Total protein synthesis was assessed by radiolabel  
incorporation. The finding that relatively large current  
densities were required to measurably increase protein  
synthesis does not necessarily indicate that  
physiological current densities are unimportant. The  
change in total protein synthesis indicates that electric  
fields may play a role in physiological regulation of

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AD-A194 751 CONTINUED

SRI INTERNATIONAL MENLO PARK CA

(U) Neurophysiological Bases of Event-Related Potentials.

DESCRIPTIVE NOTE: Final rept. 1 May 82-30 Nov 87.

MAR 88 226P

PERSONAL AUTHORS: Rebert, Charles S.

CONTRACT NO. F49620-82-K-0018

PROJECT NO. 2313

TASK NO. A4

MONITOR: AFOSR  
TR-88-0472

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Original contains color plates. All DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) In order to more fully understand the physiological and psychological significance of event-related brain potentials (ERPs), cortical and subcortical recordings were obtained from monkeys performing an operant conditioning task (cued reaction time). Five groups of monkeys each were studied over a period of five years to examine several important issues--distribution of ERPs in the brain, neurochemical mediators of ERPs, homology of ERPs across species, relationship of ERPs to associative conditioning, and the effects of varying signal and non-signal proportionalities. ERPs in some monkeys increased in amplitude when the warning stimulus was made a rare event. It seems clear that a complex intracerebral system mediates the generation of scalp-recorded ERPs. Chemical (AP5) inhibition or destruction of the pars compacta region of substantia nigra in three monkeys produced Parkinsonism and a lengthening of movement time with less effect on initiation time, and decreased the amplitudes of ERPs in the nigral region and the M2 component of premotor cortex. Behavior was disrupted by cholinergic antagonism whether or not the drug crossed the blood-brain barrier, suggesting caution in the interpretation of the effects of systemically administered drugs on ERPs.

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DESCRIPTORS: (U) \*NEUROPHYSIOLOGY, \*NEUROCHEMISTRY, BARRIERS, BLOOD, BRAIN, CEREBRAL CORTEX, DRUGS, INHIBITION, MONKEYS, REACTION TIME, STIMULI, TIME, WARNING SYSTEMS, NERVE TRANSMISSION, STRESS (PSYCHOLOGY), ELECTROENCEPHALOGRAPHY.

IDENTIFIERS: (U) \*ERPs (Event Related Brain Potentials), Event related potentials, PE6102F, LPN-SRI-LSU-4373.



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 744 CONTINUED

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Examination of Mechanisms and Fuel-Molecular Effects on Soot Formation.

DESCRIPTIVE NOTE: Final rept. 15 Nov 84-14 Nov 87.

FEB 88 108P

PERSONAL AUTHORS: Colket, Meredith, III; Seery, D. J.; Sangiovanni, Joseph J.

REPORT NO. UTRC/R88-957047

CONTRACT NO. F49620-85-C-0012

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-88-0474

UNCLASSIFIED REPORT

ABSTRACT: (U) A variety of hydrocarbons has been pyrolyzed in a single-pulse shock tube over the temperature range of 1000 to 2400 K and for dwell times of 500 to 700 microseconds. Gas samples of reactant, intermediate, and final products were collected and analyzed using gas chromatography. Chemical kinetic models in good agreement with data were developed for several of the hydrocarbons that were pyrolyzed. Specific mechanisms and rate coefficients have been proposed in order to describe formation of aromatic hydrocarbons. These latter processes are believed to lead to the formation of polycyclic aromatic hydrocarbons, soot precursors, and eventually soot. The work has focused on the pyrolysis of acetylene, since this species appears to be the dominant species in soot-forming regions of flames and has been shown to play a major role in the soot-forming process. Keywords: Hydrocarbon pyrolysis, Oxidation, Acetylene, Ethylene, Vinylacetylene, Benzene, Formation of aromatics, Soot formation.

DESCRIPTORS: (U) \*AROMATIC COMPOUNDS, \*HYDROCARBONS, \*POLYCYCLIC COMPOUNDS, \*PYROLYSIS, \*SOOT, \*FUELS, ACETYLENE, AROMATIC HYDROCARBONS, BENZENE, COEFFICIENTS,

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DWELL TIME, ETHYLENE, GAS CHROMATOGRAPHY, GASES, OXIDATION, REACTION KINETICS, SYNTHESIS(CHEMISTRY), SHOCK TUBES, SYMPOSIA.

IDENTIFIERS: (U) Shock tube tests, WJAFOSR2308A2, PEB1102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A194 699 12/9 12/5

WILEY (JOHN) AND SONS INC NEW YORK

OPTICAL SOCIETY OF AMERICA WASHINGTON D C

(U) Proceedings of the International Symposium on Quantum Biology and Quantum Pharmacology (14th) Held in Marinaland, Florida on March 12-14 1987. Annual Sanibel Symposia (27th). Part 1.

(U) Summaries of Papers Presented at the Topical Meeting on Optical Computing Held in Incline Village, Nevada on March 16-18, 1987.

DESCRIPTIVE NOTE: Final report.

DESCRIPTIVE NOTE: Final rept. 15 Mar 87-31 Mar 88.

87

MAR 88 283P

PERSONAL AUTHORS: Lowdin, Per-Olov

PERSONAL AUTHORS: Quinn, Jarus W.

CONTRACT NO. AFOSR-87-0111, N00014-87-G-0054

CONTRACT NO. AFOSR-87-0309

PROJECT NO. 2303

PROJECT NO. 2305

TASK NO. 83

TASK NO. 84

MONITOR: AFOSR  
TR-88-0685MONITOR: AFOSR  
TR-88-0402

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also part 2, AD-A194 786.

SUPPLEMENTARY NOTE: Includes Postdeadline Papers and an errata sheet.

ABSTRACT: (U) The 27th Annual Sanibel Symposia, which included the 14th meeting of the Symposium on Quantum Biology and Quantum Pharmacology, was held on March 12-21, 1987 at the University of Florida Marine Biology Laboratory at Marineland on the Atlantic Coast of Florida. These proceedings comprise contributions of both invited talks and poster presentations. Submitted papers were subjected to the ordinary refereeing procedures of the International Journal of Quantum Chemistry. Although some of the papers fall outside the ordinary scope of quantum chemistry they reflect the content of the symposium.

DESCRIPTORS: (U) \*MOLECULAR BIOLOGY, \*PHARMACOLOGY, \*QUANTUM CHEMISTRY, \*QUANTUM THEORY, MARINE BIOLOGY, SYMPOSIA.

IDENTIFIERS: (U) \*Quantum biology, \*Quantum pharmacology, WUAFOSR230383, PE81102F.

DESCRIPTORS: (U) \*OPTICAL PROCESSING, \*COMPUTER ARCHITECTURE, ALGORITHMS, COMPUTATIONS, HOLOGRAMS, IMAGE PROCESSING, OPTICS, PATTERN RECOGNITION, SYMPOSIA, ABSTRACTS.

IDENTIFIERS: (U) Optical computing, PE81102F, WUAFOSR230584.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

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AD-A184 895

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NORTHWESTERN UNIV EVANSTON IL DEPT OF MATERIALS SCIENCE  
AND ENGINEERING

CALIFORNIA UNIV RIVERSIDE DEPT OF STATISTICS

(U) Application of Cross Correlation to HREM Images of  
Surfaces,

87

3P

PERSONAL AUTHORS: LUZZI, D. E.; Marks, L. D.; Buckett, M.  
I.

CONTRACT NO. AFOSR-88-0344

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-87-1811

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of the Annual  
Meeting of the Electron Microscopy Society of America  
(45th), p754-755 1987.

ABSTRACT: (U) As the HREM becomes increasingly used for  
the study of dynamic localized phenomena, the development  
of techniques to recover the desired information from a  
real image is important. Often, the important features  
are not strongly scattering in comparison to the matrix  
material in addition to being masked by statistical and  
amorphous noise. The desired information will usually  
involve the accurate knowledge of the position and  
intensity of the contrast. We have examined basic cross-  
correlation procedures using images of discrete gaussian  
peaks and have developed an iterative procedure to  
greatly enhance the capabilities of these techniques when  
the contrast from the peaks overlap (1). In the present  
paper, we apply these techniques to multislice generated  
images of simulated surface structures.

DESCRIPTORS: (U) \*ELECTRON MICROSCOPY, \*IMAGE PROCESSING,  
AMORPHOUS MATERIALS, CONTRAST, CROSS CORRELATION,  
DYNAMICS, IMAGES, INTENSITY, ITERATIONS, MATRIX MATERIALS,  
NOISE, OVERLAP, SCATTERING, SIMULATION, STRUCTURES,  
SURFACES, REPRINTS, HIGH RESOLUTION, REPRINTS.

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(U) Dispersion Models and Estimation of Dispersion Effects  
in Replicated Factorial Experiments.

DESCRIPTIVE NOTE: Technical rept. Dec 87-Mar 88.

MAR 88

17P

PERSONAL AUTHORS: Ghosh, Subir; Lagergren, Eric S.

REPORT NO. TR-188

CONTRACT NO. AFOSR-88-0092

PROJECT NO. 2304

MONITOR: AFOSR  
TR-88-0391

UNCLASSIFIED REPORT

ABSTRACT: (U) This paper considers the problem of  
estimation of dispersion effects of factors in replicated  
factorial experiments under a general dispersion model.  
The authors also characterize the arrays so that the  
estimation of dispersion effects is possible. The problem  
considered in this paper arises in quality control  
studies and the methodologies are applicable to  
industrial experiments. Keywords: Linear models; Quality  
control.

DESCRIPTORS: (U) \*COMBINATORIAL ANALYSIS, \*QUALITY  
CONTROL, DISPERSING, ESTIMATES, INDUSTRIES, LINEARITY,  
MATHEMATICAL MODELS.

IDENTIFIERS: (U) PE61102F.

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## DYIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI46A

AD-A194 871 12/9

NEBRASKA UNIV LINCOLN DEPT OF MATHEMATICS AND STATISTICS

(U) Canonical Forms in the Control of DPS.

DESCRIPTIVE NOTE: Final rept. 1 Apr 88-31 Mar 88,

APR 88 3P

PERSONAL AUTHORS: Rebarber, Richard

CONTRACT NO. AFOSR-88-0079

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0439

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) Control canonical forms play an important role in the analysis of finite-dimensional problems in control theory. The goal of this research was to extend these results and develop control canonical forms for infinite-dimensional systems. These results were derived for a broad class of problems, including some with unbounded input (as occurs with boundary control problems). This analysis led to approximate feedback control methods (i.e., using finite-dimensional controls) by truncating the resulting series which solves the eigenvalue specification problem. Results were published in a series of five papers, including Canonical forms for a class of distributed parameter control systems, Spectral assignability for disturbed parameter systems with unbounded scalar control, and Spectral determination for a cantilever beam.

**DESCRIPTORS:** (U) \*CONTROL THEORY, APPROXIMATION(MATHEMATICS), BOUNDARY VALUE PROBLEMS, CONTROL SYSTEMS, DISTRIBUTION, EIGENVALUES, FEEDBACK, INPUT, PARAMETERS, SCALAR FUNCTIONS, SIZES(DIMENSIONS), SPECIFICATIONS.

**IDENTIFIERS:** (U) PE61102F, WUAFOSR2304A1.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF AERONAUTICS AND ASTRONAUTICS

(U) Approximate Evaluation of Semi-Markov Chain Reliability Models.

FEB 88 22P

PERSONAL AUTHORS: Vereley, Norman M.; Walker, Bruce K.

CONTRACT NO. AFOSR-84-0160

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-88-0397

## UNCLASSIFIED REPORT

**SUPPLEMENTARY NOTE:** Prepared in cooperation with Cincinnati Univ., Cincinnati, OH, Dept. of Aerospace Engineering and Engineering Mechanics.

**ABSTRACT:** (U) A property observed in high reliability fault tolerant control systems is the relatively rare occurrence of component failures compared to the frequent occurrence of redundancy management decision events. This property leads to a temporal decomposition of the semi-Markov chain reliability model into two time scales: a slow time scale for failure events, a fast time scale for FDI events. Conditions are described under which a perturbed semi-Markov chain can be approximated by an enlarged Markov process, the parameters of which are derived from the parameters of the semi-Markov chain.

**DESCRIPTORS:** (U) \*MARKOV PROCESSES, \*MATHEMATICAL MODELS, DECISION MAKING, FAILURE, MANAGEMENT, PERTURBATIONS, REDUNDANCY, FAULT TOLERANT COMPUTING, RELIABILITY, SCALE, TEST AND EVALUATION, TIME.

**IDENTIFIERS:** (U) \*Markov chains, PE61102F, WUAFOSR2304A5.

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AD-A194 851 9/1 12/3

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

OHIO STATE UNIV COLUMBUS DEPT OF STATISTICS

(U) Cyclic Voltammetric Investigation of Disilenes.

(U) Burn-in with Mixed Populations.

88 5P

DESCRIPTIVE NOTE: Doctoral thesis Jul 84-30 Sep 87.

PERSONAL AUTHORS: Shepherd, Brian D.; West, Robert

AUG 87 198P

CONTRACT NO. F49620-86-C-0010

PERSONAL AUTHORS: Pan, Un-Quei W.; Blumenthal, Saul

PROJECT NO. 2303

REPORT NO. TR-372

TASK NO. 82

CONTRACT NO. AFOSR-84-0182

MONITOR: AFOSR  
TR-88-0383

PROJECT NO. 2304

TASK NO. K3

MONITOR: AFOSR  
TR-88-0478

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemistry Letters, p183-188  
1988.

UNCLASSIFIED REPORT

ABSTRACT: (U) Three tetraaryldisilenes and two dialkylaryldisilenes were investigated by cyclic voltammetry, all undergoing irreversible oxidation and reduction. The oxidation potentials were similar for all five compounds, but the reduction potentials were lower for the tetraaryldisilenes than for the dialkylaryldisilenes.

ABSTRACT: (U) Any electronic component may be either perfect or defective. The lifetime distributions of both types are assumed known. We assume that perfect items never fail. Before being used, each production lot is tested to eliminate some of its defectives, i.e., the lot is subjected to burn-in. Here, the purpose of burn-in is to ensure with a given confidence level that an item chosen randomly from the test survivors has a given probability of operating properly for a given time period. Three procedures are considered. Small sample theory is investigated for various assumptions about the information available concerning the number of defectives by using both analytic techniques and simulation. Large sample theory is studied, as well. This study shows that the first two procedures are sensitive to the number of defective items assumed and the performance of the third procedure is not. Keywords: Burn-in; Sequential stopping; Reliability; Mixed populations.

DESCRIPTORS: (U) \*VOLTAMMETRY, \*OXIDATION REDUCTION REACTIONS, \*SILICON COMPOUNDS, \*ALKYL RADICALS, \*ARYL RADICALS, CYCLES, POTENTIAL THEORY, IRREVERSIBLE PROCESSES, OXIDATION, PHOTOELECTRON SPECTRA, ANISOTROPY, ULTRAVIOLET SPECTROSCOPY, SOLID STATE CHEMISTRY, REPRINTS.

IDENTIFIERS: (U) Disilenes, PE81102F, WUAFOSR230382.

DESCRIPTORS: (U) \*RELIABILITY(ELECTRONICS), \*STATISTICAL ANALYSIS, \*LIFE EXPECTANCY(SERVICE LIFE), CONFIDENCE LEVEL, DEFECTS(MATERIALS), DISTRIBUTION, MIXING, POPULATION, PRODUCTION, SIMULATION, STOPPING, GUARANTEES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304K3.

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AD-A194 650 1/3 20/4 CONTINUED

FLORIDA AGRICULTURAL AND MECHANICAL UNIV TALLAHASSEE  
FLUID MECHANICS RESEARCH LAB

(U) Unsteady Flow Past an NACA 0012 Airfoil at High Angles  
of Attack.

DESCRIPTIVE NOTE: Technical rept. Jul 88-Dec 87.

MAR 88 26P

PERSONAL AUTHORS: Krothapalli, A.; Lourenco, L.; Van  
Dommelen, L.

REPORT NO. FMRL-TR-2

CONTRACT NO. AFOSR-86-0243

PROJECT NO. 2307

TASK NO. A3

MONITOR: AFOSR  
TR-88-0415

UNCLASSIFIED REPORT

ABSTRACT: (U) A whole field experimental technique, commonly referred to as Particle Image Velocimetry, was used for the measurement of the instantaneous two-dimensional velocity fields about an impulsively started NACA 0012 airfoil at high angles of attack. The velocity field was measured with sufficient accuracy, such that the time evolution of the vorticity field was obtained. The experiments were performed in a towing at a Reynolds number of 1400, based on the chord of the airfoil. For angles of attack greater than about 20 deg, the flow field at the upper surface of the airfoil show large scale vortical motions with the following time dependent scenario. At the initial stages of the airfoil startup, a separation bubble at the leading edge was generated and with time, it grows into an isolated primary vortex which dominated the whole flow field. Trailing behind this primary vortex were two counter rotating vortices. This multiple vortex structure grow together and move along the upper surface until it reaches the trailing edge. At this time, the primary vortex induces a trailing edge vortex. The primary and trailing edge vortices then form the wake flow field.

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DESCRIPTORS: (U) \*AIRFOILS, \*ANGLE OF ATTACK, \*UNSTEADY FLOW, ACCURACY, COUNTERROTATION, EDGES, HIGH ANGLES, LEADING EDGES, SCENARIOS, TIME, TRAILING EDGES, TRAILING VORTICES, TWO DIMENSIONAL, VELOCIMETERS, VELOCITY, WAKE, AERODYNAMIC LOADING, NAVIER STOKES EQUATIONS.

IDENTIFIERS: (U) \*NACA 0112 Airfoils, PES1102F, WUAFOSR2307A3.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 849 CONTINUED

AD-A194 849 5/8 6/4

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Probing Cognitive Processes through the Structure of Event-Related Potentials during Learning: An Experimental and Theoretical Analysis.

DEC 87 18P

PERSONAL AUTHORS: Banquet, Jean-Paul; Grossberg, Stephen

CONTRACT NO. F49620-88-C-0037, NSF-IR184-17758

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-88-0388

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Applied Optics, v26 p4931-4946, 1 Dec 87.

ABSTRACT: (U) Data reporting correlated changes, due to learning, in the amplitudes and chronometry of several event-related potentials (ERPs) are compared to neural explanations and predictions of the adaptive resonance theory. The ERP components processing negativity (PN), early positive wave (P120), N200, and P300 covary with model processes of attentional priming and top down expectancy, learning, matching of bottom up input patterns with learned top-down expectations, mismatch-mediated activation of the orienting subsystem, reset by the orienting subsystem of recognition codes in short term memory, and direct activation of recognition codes via a bottom up adaptive filter. These model mechanisms enable a recognition code to be learned in a self stabilizing fashion in response to an input environment of arbitrary complexity. Thus spatiotemporal correlations among several ERPs during learning provide important evidence in support of postulated neural mechanisms for self stabilizing self organization of cognitive recognition codes. (Reprints)

DESCRIPTORS: (U) \*COGNITION, \*PSYCHOPHYSIOLOGY, ACTIVATION, ADAPTIVE FILTERS, ADAPTIVE SYSTEMS, CODING, ENVIRONMENTS, INPUT, LEARNING, MODELS, NERVOUS SYSTEM, RECOGNITION, ORIENTATION(DIRECTION), RECOGNITION, REPORTS, REPRINTS, RESONANCE, STABILIZATION, THEORY, WAVES.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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20/4

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) An Improved Method for the Direct Computation of  
Diatomic Centrifugal Distortion Constants.

87 8P

87

15P

PERSONAL AUTHORS: Chakraborty, Dilip K.; Tellinghuisen,  
Patricia C.; Guo, Baochuan; Tellinghuisen, Joel

PERSONAL AUTHORS: Dias, Frederic; Elcraat, Alan R.;  
Trefethen, Lloyd N.

CONTRACT NO. AFOSR-83-0110

CONTRACT NO. AFOSR-87-0102

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. B1

TASK NO. A2

MONITOR: AFOSR  
TR-88-0446

MONITOR: AFOSR  
TR-88-0445

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular  
Spectroscopy, v122 p455-461 1987.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Fluid Mechanics, v185  
p275-288 1987.

ABSTRACT: (U) A new algorithm for the numerical solution  
of inhomogeneous second-order differential equations is  
applied to the perturbation theory calculation of  
centrifugal distortion constants in diatomic molecules.  
The new scheme entails a combined inward and outward  
generation of the solution, analogous to that which is  
employed in widely used routines for solving the  
corresponding homogeneous equation (J. W. Cooley, Math.  
Comput. 15, 363-374 (1961)). The matching at an  
intermediate point eliminates instabilities in the  
nonclassical regions and permits a straightforward  
extrapolation of the desired particular solution from the  
initial numerical solution, which contains a component of  
the homogeneous solution. Numerical tests suggest that  
this method is capable of greater precision and  
efficiency than existing methods.

DESCRIPTORS: (U) \*CENTRIFUGAL FIELDS, \*DIATOMIC  
MOLECULES, \*DISTORTION, \*NUMERICAL ANALYSIS, ALGORITHMS,  
COMPUTATIONS, CONSTANTS, EFFICIENCY, EQUATIONS,  
HOMOGENEITY, MATHEMATICS, PERTURBATION THEORY, PRECISION,  
SOLUTIONS(GENERAL).

IDENTIFIERS: (U) WJAFOSR2303B1, PEB1102F.

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ABSTRACT: (U) A jet is a stream of one fluid entering  
another at high speed. In the simplest classical model of  
jet flow, the geometry is two-dimensional, gravity and  
viscosity are ignored, the moving fluid is a liquid, and  
the stationary fluid is a gas whose influence is assumed  
negligible. The description of this idealized flow can be  
reduced to a problem of complex analysis, but, except for  
very simple nozzle geometries, that problem cannot be  
solved analytically. This paper presents an efficient  
procedure for solving the jet problem numerically in the  
case of an arbitrary polygonal nozzle. (Reprints)

DESCRIPTORS: (U) \*JET FLOW, EFFICIENCY, MOTION, NOZZLES,  
POLYGONS, REPRINTS, STREAMS, VISCOSITY, NOZZLE GAS FLOW,  
TWO DIMENSIONAL FLOW.



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AD-A194 807 CONTINUED

AD-A194 807 4/2

CONTROL DATA CORP MINNEAPOLIS MN METEOROLOGY RESEARCH CENTER

(U) An Investigation of Terrain Effects on the Mesoscale Spectrum of Atmospheric Motions.

MAR 88

PERSONAL AUTHORS: Nastrom, G. D.; Fritts, D. C.; Gage, K. S.

CONTRACT NO. F49620-88-C-0027

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-88-0441

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Atmospheric Sciences, v44 n20 p3087-3098, 15 Oct 87.

ABSTRACT: (U) Wind and atmospheric temperature data collected during the Global Atmospheric Sampling Program (GASP) are used to investigate the effects of underlying terrain on mesoscale variability, and the observational results are interpreted within the theories of gravity wave motions and quasi-two-dimensional turbulence. The data show the variances are up to six times larger over mountainous terrain than over oceans or plains, with the most striking differences at horizontal scales from 4 to 80 km. Results were subdivided between the stratosphere and troposphere, and between high- and low-background wind speed cases, and show basically the same response to topography in all cases. The linear theory of gravity waves is found to correctly predict the scaling of wave amplitude with background stability in the case of low background wind speeds, while the two-dimensional turbulence theory correctly predicts the shape of the variance spectrum and the observed amplitude scales with epsilon (the dissipation rate of turbulent kinetic energy) as required by the theory. In other cases the theoretical predictions are less satisfactory. Some possible causes of the discrepancies are likely methods to resolve them are discussed.

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DESCRIPTORS: (U) \*ATMOSPHERIC MOTION, \*GRAVITY WAVES, \*BOUNDARY LAYER, AMPLITUDE, ATMOSPHERIC TEMPERATURE, BACKGROUND, KINETIC ENERGY, LINEARITY, MOTION, MOUNTAINS, OCEANS, PREDICTIONS, REPRINTS, SCALE, SCALING FACTORS, SPECTRA, STABILITY, STRATOSPHERE, TEMPERATURE, TERRAIN, THEORY, TOPOGRAPHY, TROPOSPHERE, TURBULENCE, TWO DIMENSIONAL, VARIATIONS, WAVES, WIND VELOCITY, ATMOSPHERIC MOTION, TRANSPORT, WIND VELOCITY, TOPOGRAPHY, OROGRAPHY.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2310A1.

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## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVI46A

AD-A194 594

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ROCHESTER UNIV N Y DEPT OF ELECTRICAL ENGINEERING

(U) Phase Sensitive Amplification with SIS (Superconductor-Insulator-Superconductor) Quasiparticle Mixers.

DESCRIPTIVE NOTE: Annual rept. 18 Jan 87-14 Jan 88.

MAR 88

2P

PERSONAL AUTHORS: Bocko, Mark F.

CONTRACT NO. AFOSR-87-0131

PROJECT NO. 2305

TASK NO. C3

MONITOR: AFOSR  
TR-88-0452

## UNCLASSIFIED REPORT

ABSTRACT: (U) We have obtained the SIS junctions and RF choke structures which we will use in our experiments. These were fabricated for this project by Dr. Michael Crossar at the National Bureau of Standards Cryoelectronics Laboratory in Boulder Colorado. We have measured the DC characteristics of these junctions and have found that they have low leakage currents and RC products that are very close to our design goal. We have made preliminary calculations of the SIS mixer conversion efficiency for the real DC characteristics of our junctions and find that the results show the required phase sensitive response.

DESCRIPTORS: (U) \*MIXERS(ELECTRONICS), AMPLIFICATION, CURRENTS, DIRECT CURRENT, PHASE, RESPONSE, SENSITIVITY, TUNNELING(ELECTRONICS), LOCAL OSCILLATORS, PHASE(ELECTRONICS), JOSEPHSON JUNCTIONS, SUPERCONDUCTORS, INDUCTORS.

IDENTIFIERS: (U) WUAFOSK2305C3, PE61102F.

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PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

(U) Coupling between Radiation and Gas Dynamics.

DESCRIPTIVE NOTE: Annual rept. 1 Feb 87-1 Feb 88.

MAR 88

52P

PERSONAL AUTHORS: Markle, Charles L.; Micci, Michael M.

CONTRACT NO. AFOSR-84-0048

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0448

## UNCLASSIFIED REPORT

ABSTRACT: (U) Direct heat addition of flowing gases by radiation absorption is considered. In the visible wavelength regime, the interaction between concentrated solar energy and a flowing gas is being modeled numerically. Additional analyses of laser-gasdynamic interactions are also being considered. Implicit time-iterative procedures originally developed for transonic flows are being adapted to the low Mach number, low Reynolds number regimes of interest. Two-dimensional solutions show that absorption plasmas can exist over a wide range of flow speeds and that buoyancy is a dominant factor in the forced convection flowfields. In the microwave regime, an experimental investigation of various absorption modes is underway. An overview of the microwave resonant cavity experiment and initial experimental results with nitrogen is presented. Numerical predictions of the planar and propagation plasma mode of microwave absorption in hydrogen, helium and nitrogen are also discussed. Keywords: Laser gasdynamic interaction, Microwave heating, Gases, Beamed energy, Advanced propulsion.

DESCRIPTORS: (U) \*GAS DYNAMICS, \*PLASMAS(PHYSICS), \*LASER BEAMS, \*THERMAL PROPULSION SYSTEMS, ADDITION, BUOYANCY, CAVITIES, CONVECTION, FLOW, FLOW FIELDS, GAS FLOW, GASES, HEAT, HEATING, HELIUM, HYDROGEN,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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INTERACTIONS, LOW RATE, WACH NUMBER, MATHEMATICAL  
PREDICTION, MICROWAVE FREQUENCY, MICROWAVES, NITROGEN,  
PLANAR STRUCTURES, PROPAGATION, PROPULSION SYSTEMS,  
RANGE(EXTREMES), RESONANCE, REYNOLDS NUMBER, SOLAR ENERGY,  
SOLUTIONS(GENERAL), TRANSONIC FLOW, TWO DIMENSIONAL,  
VELOCITY, VISIBLE SPECTRA, RADIATION ABSORPTION, RADIANT  
HEATING.

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC  
PROCESSES

(U) An Asymptotic Evaluation of the Tail of a Multiple  
Symmetric Alpha-Stable Integral.

DESCRIPTIVE NOTE: Technical rept.,

IDENTIFIERS: (U) Laser heating, WUAFOSR2308A1, PE61102F.

FEB 88 28P

PERSONAL AUTHORS: Samorodnitsky, Gennady; Szulga, Jerzy

REPORT NO. TR-228

CONTRACT NO. F49820-85-C-0144

PROJECT NO. 2304

MONITOR: AFOSR  
TR-88-0419

UNCLASSIFIED REPORT

ABSTRACT: (U) Expand a multiple symmetric alpha stable  
integral multiple sums over  $f(t \text{ sub } 1, \dots, t \text{ sub } n) dM(t \text{ sub } 1) \dots dM(t \text{ sub } n)$  into a Le Page type multiple series  
of transformed arrival times of a Poisson process. An  
exact evaluation of the limit of appropriately normalized  
tail distribution results from this representation.  
Keywords: Multiple stochastic integral; Stable Levy  
process; Poisson process.

DESCRIPTORS: (U) \*INTEGRALS, \*ASYMPTOTIC NORMALITY,  
ARRIVAL, DISTRIBUTION, POISSON EQUATION, STOCHASTIC  
PROCESSES, NORMAL DISTRIBUTION, RANDOM VARIABLES.

IDENTIFIERS: (U) PE61102F, WUAFOSR2304.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV148A

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NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

IDENTIFIERS: (U) \*Gaussian processes, PE01102F, WUAFOSR2304A5.

(U) Limiting Distributions of Non-Linear Vector Functions of Stationary Gaussian Processes.

DESCRIPTIVE NOTE: Technical rept. Sep 87-Aug 88,

MAR 88 21P

PERSONAL AUTHORS: Ho, Hwai-Chung; Sun, Yze-Chien

REPORT NO. TR-228

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-88-0418

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Wayne State Univ., Detroit, MI. Dept. of Mathematics.

ABSTRACT: (U) Given a stationary Gaussian vector process  $x$  sub  $m$ ,  $y$  an element of  $Z$ , and two real functions  $H(x)$  and  $K(x)$  we define  $Z$  sub  $H$  superscript  $N$  sum from  $m=1$  to  $(n-1)$  of Inverse  $A$  sub  $n$  sum from  $m=1$  to  $(n-1)$  of Sub  $m$  and Sub  $K$  superscript  $k$  Inverse  $B$  sub  $n$  sum from  $m=1$  to  $(n-1)$  of Sub  $n$  where  $A_n$  and  $B_n$  are some appropriate constants. The joint limiting distribution of Sub  $H$  superscript  $n$  Sub  $K$  superscript  $k$  is investigated. It is shown that Sub  $H$  superscript  $n$  and Sub  $K$  superscript  $k$  are asymptotically independent when one of them satisfies a central limit theorem. The application of this to the limiting distribution for a certain class of non-linear infinite-coordinated functions of a Gaussian process is also discussed. Keywords: Central limit theorem; Nin-central limit theorem; Long range dependence; Stationary Gaussian vector processes.

DESCRIPTORS: (U) \*STATISTICAL PROCESSES, \*VECTOR ANALYSIS, DISTRIBUTION, LIMITATIONS, LONG RANGE(DISTANCE), LONG RANGE(TIME), NONLINEAR SYSTEMS, STATIONARY, THEOREMS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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VRIJE UNIV BRUSSELS (BELGIUM) DEPT OF FLUID MECHANICS

WALLS, ASYMMETRY, CASCADE STRUCTURES, TURBOMACHINERY.

(U) Radial Mixing in Turbomachines.

IDENTIFIERS: (U) \*Radial mixing, End walls, PE61102F, WUAFOSR230751.

DESCRIPTIVE NOTE: Final scientific rept. 1 Sep 85-31 Aug 87.

FEB 88 69P

PERSONAL AUTHORS: Deruyck, J.; Hirsch, C.

REPORT NO. VUB-TN-40

CONTRACT NO. AFOSR-85-0167

PROJECT NO. 2307

TASK NO. 51

MONITOR: AFOSR  
TR-88-0421

UNCLASSIFIED REPORT

**ABSTRACT** (U) A radial mixing calculation method is presented where both convective and turbulent mixing processes are included. The secondary flows needed for the convective mixing are derived from pitch averaged vorticity equations combined with integral methods for the 3D end-wall boundary layers, 3D profile boundary layers and 3D asymmetric wakes. The convective transport due to secondary flows is computed explicitly. The method is applied to a cascade and two single stage rotors. The three test cases show a very different secondary flow behaviour which allows the analysis of the relative importance of the different secondary flow effects. Turbulent diffusion is found to be the most important mixing mechanism, whereas convective mixing becomes significant when overall radial velocities exceed about 5% of the main velocities. The wake diffusion coefficient is found to be representative for the turbulent radial mixing and is the only empirical constant to be determined.

**DESCRIPTORS:** (U) \*MIXING, \*SECONDARY FLOW, \*WAKE, COMPUTATIONS, CONVECTION, DIFFUSION, EQUATIONS, RADIAL VELOCITY, TRANSPORT, TURBULENCE, TURBULENT FLOW, VELOCITY, VORTICES, THREE DIMENSIONAL FLOW, BOUNDARY LAYER FLOW,

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OKLAHOMA STATE UNIV STILLWATER DEPT OF PHYSICS

(U) Photorefractive Damage Mechanism in Electro-Optic Materials.

DESCRIPTIVE NOTE: Annual rept. 15 Jul 87-15 Feb 88.

MAR 88

18P

PERSONAL AUTHORS: Halliburton, Larry E.

CONTRACT NO. AFOSR-85-0270

PROJECT NO. 2305

TASK NO. 81

MONITOR: AFOSR

TR-88-0451

UNCLASSIFIED REPORT

ABSTRACT: (U) The photo-induced redistribution of charge has been characterized in Bi12GeO20 and Bi12SiO20 crystals using electron spin resonance, thermally stimulated luminescence, and optical absorption techniques. Our results suggest that Fe3+ ions play an important role in the photorefractive effect in these materials. Keywords: Bismuth compounds, Silicon compounds, Germanium compounds.

DESCRIPTORS: (U) \*ELECTRON SPIN RESONANCE, \*ELECTROOPTICS, \*GERMANIUM COMPOUNDS, \*SILICON COMPOUNDS, ABSORPTION, BISMUTH COMPOUNDS, HEAT, LUMINESCENCE, METHODOLOGY, OPTICAL MATERIALS, OPTICS, STIMULATION(GENERAL).

IDENTIFIERS: (U) PE81102F, WJAFOSR2305B1.

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BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Convex Duality Approach to the Optimal Control or Diffusions,

JAN 88

30P

PERSONAL AUTHORS: Fleming, Wendell H.; Varmes, Demokos

REPORT NO. LCDS/CCS-88-2

CONTRACT NO. AFOSR-85-0315, N00014-83-K-0542

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0389

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Contract F49620-88-C-0111 and Grant NSF-WCS81-21940.

ABSTRACT: (U) Partial contents: the weak formulation of the problem; duality and the Hamilton-Jacobi problem; equivalence of the Strong and weak formulations; a Sobolev approximation of the value function; Semi-continuous costs; inclusion of terminal penalties. Keywords: Stochastic differential equations; Mathematical programming; Control theory.

DESCRIPTORS: (U) \*CONTROL THEORY, \*MATHEMATICAL PROGRAMMING, CONTROL, CONVEX BODIES, DIFFERENTIAL EQUATIONS, FORMULATIONS, OPTIMIZATION, STOCHASTIC PROCESSES, DIFFUSION, AIR FORCE RESEARCH.

IDENTIFIERS: (U) PE81102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

MEASUREMENT, NOISE, PROBABILITY, TIME INTERVALS, APPLIED MATHEMATICS, WHITE NOISE, PROBLEM SOLVING.

(U) Minimizing Escape Probabilities: A Large Deviations Approach.

IDENTIFIERS: (U) PE81102F.

OCT 87 33P

PERSONAL AUTHORS: Dupuis, Paul; Kushner, Harold

REPORT NO. LCDS/CCS-87-40

CONTRACT NO. DAAL03-86-K-0171, SAFOSR-85-0315

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0393

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Grants NSF-DMS85-11470 and NSF-ECS85-05874.

ABSTRACT: (U) This document considers the problem of controlling a possibly degenerate diffusion process so as to minimize the probability of escape over a given time interval. It is assumed that the control acts on the process through the drift coefficient, and that the noise coefficient is small. By developing a large deviations type theory for the controlled diffusion, the authors obtain several results. The limit of the normalized log of the minimum exit probability is identified as the value  $I$  of an associated (deterministic) differential game. Furthermore, the authors identify a deterministic (and epsilon independent) mapping  $g$  from the sample values  $w(s)$ ,  $0 \leq s \leq T$ , into the control space such that if we define the control used at time  $t$  by  $u(t) = g(\epsilon w(s))$ ,  $0 \leq s \leq T$ , or  $u = \tau$ , then the resulting control process is progressively measurable and delta optimal (in the sense that the limit of the normalized log of the exit probability is within delta of  $I$ ).

DESCRIPTORS: (U) \*CONTROL THEORY, COEFFICIENTS, CONTROL, DIFFERENTIAL EQUATIONS, DIFFUSION, DRIFT, EXITS,

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NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

RENSSELAER POLYTECHNIC INST TROY NY DEPT OF CHEMICAL ENGINEERING

(U) Synthesis of 8,8,11,11-tetranitropentacyclo(5.4.0.0(2,6).0(3,10).0(5,9))un-decane.

88 5P

PERSONAL AUTHORS: Marchand, Alan P.; Arney, Benny E., Jr.; Dave, Paritosh R.

PERSONAL AUTHORS: Slavejkov, Aleksandar G.; Rogowski, Donald F.; Fontijn, Arthur

CONTRACT NO. DAAA21-86-C-0091, AFOSR-84-0085

CONTRACT NO. AFOSR-86-0019

PROJECT NO. 2303

PROJECT NO. 2308

TASK NO. 82

MONITOR: AFOSR

TASK NO. A1

TR-88-0491

MONITOR: AFOSR  
TR-88-0422

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v53 n2 p443-446 1988.

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v143 n1 p28-30, 1 Jan 88.

ABSTRACT: (U) There is considerable current interest in the synthesis and chemistry of polynitropolycyclic cage molecules. As part of a program that is invol

ABSTRACT: (U) A method for the production of Boron chloride in flow systems has been developed and used for the study of the title reaction in a high-temperature fast-flow reactor (HTFFR). The temperature dependence of the rate coefficients is described by the expression  $k(T) = 2.2 \times 10^{-10} \exp(-4620K/T)$  cc/molecule/s, consistent with a single reaction mechanism for the given temperature range. These  $k(T)$  values are larger than those observed for the isoelectronic Aluminum chloride and Boron fluoride + O<sub>2</sub> reactions.

DESCRIPTORS: (U) \*DECANES, \*NITRO RADICALS, \*CYCLIC COMPOUNDS, CHEMISTRY, SYNTHESIS(CHEMISTRY), REPRINTS.

IDENTIFIERS: (U) Decane/tetranitro pentacyclo, PE81102F, WUAFOSR230382.

DESCRIPTORS: (U) \*BORON, \*CHLORIDES, COEFFICIENTS, FAST REACTORS, HIGH TEMPERATURE, KINETICS, MOLECULES, PRODUCTION, RANGE(EXTREMES), RATES, RESPONSE, TEMPERATURE, THERMAL PROPERTIES.

IDENTIFIERS: (U) \*Boron chlorides, PE81102F, WUAFOSR2308A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF APPLIED  
MATHEMATICS AND STATISTI CS

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

(U) Axiomatic Characterizations of Continuum Structure  
Functions.

(U) Adsorbate-Induced Reconstruction of p(2x2)X Adlayers  
on Ni(100).

88 88 OP

DESCRIPTIVE NOTE: Rept. for Dec 88-Dec 87.

PERSONAL AUTHORS: Benziger, Jay; Schoofs, Gregory; Myers,  
Andrea

DEC 87 5P

PERSONAL AUTHORS: Kim, Chul; Baxter, Laurence A.

CONTRACT NO. AFOSR-88-0050

CONTRACT NO. AFOSR-84-0243

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. A2

TASK NO. A5

MONITOR: AFOSR  
TR-88-0425

MONITOR: AFOSR  
TR-88-0444

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Operations Research Letters,  
v8 n6 p287-300 Dec 87.

SUPPLEMENTARY NOTE: Pub. in Langmuir, v4 n2 p288-276 1988.

ABSTRACT: (U) A continuum structure function is a  
nondecreasing mapping from the unit hypercube to the unit  
interval. Axiomatic characterizations of the continuum  
structure functions based on the Barlow-Wu and Natvig  
multistate structure functions are derived.

ABSTRACT: (U) The effects of adatoms on the adsorption  
of carbon monoxide on metal surfaces have received a  
tremendous amount of attention. On metal surfaces the  
adsorption of carbon monoxide has generally been likened  
to the bonding of CO in metal carbonyls as suggested by  
Blyholder. We are attempting a systematic experimental  
test of the concepts outlined above using temperature-  
programmed desorption (TPD) and reflection absorption-  
infrared spectroscopy (RAIS) of carbon monoxide on a  
series of well-defined Ni(100)-p(2x2)X surfaces with  
carbon, nitrogen, oxygen, sulfur, and chlorine adlayers.

DESCRIPTORS: (U) \*CONTINUUM MECHANICS, FUNCTIONS,  
INTERVALS, REPRINTS, RELIABILITY, MAPPING(TRANSFORMATIONS)

DESCRIPTORS: (U) \*ADSORPTION, \*NICKEL, ADATOMS,

ABSORPTION, CARBON MONOXIDE, METAL CARBONYLS, NITROGEN,  
ABSORPTION SPECTRA, INFRARED SPECTROSCOPY, REFLECTION,  
SPECTROSCOPY, EXPERIMENTAL DESIGN, TEST AND EVALUATION,  
CARBON, CHLORINE, METALS, SURFACES, OXYGEN, SULFUR,  
REPRINTS.

IDENTIFIERS: (U) Structure functions, PEB1102F,  
WUAFOSR2304A5.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2303A2.

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MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF AERONAUTICS  
AND ASTRONAUTICS

TRAJECTORIES, MODULATION, POWER, RADIATION, REPRINTS,  
SOURCES, SPACECRAFT, STRUCTURES, VERY LOW FREQUENCY,  
WAVES.

(U) Radiation from Large Space Structures in Low Earth  
Orbit with Induced Alternating Currents.

IDENTIFIERS: (U) PE61102F, WJAFDSR3484A2.

MAR 88 17P

PERSONAL AUTHORS: Hastings, D. E.; Barnett, A.; D'ibert, S.

CONTRACT NO. F49820-86-C-0128, \$NAG3-895

PROJECT NO. 3484

TASK NO. A2

MONITOR: AFOSR  
TR-88-0458

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Geophysical Research,  
V93 NA3 p1945-1960, 1 Mar 88.

ABSTRACT: (U) Large conducting space structures in low  
Earth orbit will have a nonnegligible induced potential  
across their structures. The induced current flow through  
the body and the ionosphere causes the radiation of  
Alfven and lower hybrid waves. This current flow is taken  
to be ac, and the radiated power is studied as a function  
of the ac frequency. The current may be ac because of  
either inductive coupling from the power system on the  
structure or active modulation. A space station-like  
structure and tether are studied. For the space station  
structure the radiation impedance is particularly high  
for frequencies in the tens of kilohertz range, which  
suggests that the space station may be an efficient  
source of lower hybrid waves. The tether is also shown to  
be a generator of VLF waves up to source ac frequencies  
in the megahertz range. The implications for these two  
structures are discussed. Keywords: Reprints, Plasma  
radiations, Ionosphere, Large space structures.

DESCRIPTORS: (U) \*GENERATORS, \*SPACE STATIONS,  
ALTERNATING CURRENT, COUPLING CIRCUITS, EARTH ORBITS,  
EFFICIENCY, ELECTRIC CURRENT, FLOW, FREQUENCY, HIGH  
FREQUENCY, HYBRID SYSTEMS, IMPEDANCE, INDUCED  
ENVIRONMENTS, INDUCTANCE, IONOSPHERE, LOW ORBIT

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NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) Syn-8, syn-13-bis(benzoyloxy)heptacyclo(7.8.0.0.(2,7).0(4,14).0(5,12).0(8,10).0(11,15))pentadecan-3-one,

87 4P

PERSONAL AUTHORS: Filippen-Anderson, Judith L.; Gilardi, Richard; George, Clifford; Marchand, Alan P.; Earlywine, Arthur D.

CONTRACT NO. N00017-88-M-R828, \$AFOSR-84-0085

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-88-0489

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Crystallographica, VC43 p2364-2366 1987.

ABSTRACT: (U) The structure of syn-8, syn-13-bis(benzoyloxy)heptacyclo(7.8.0.0.(2,7).0(4,14).0(5,12).0(8,10).0(11,15))pentadecan-3-one has been determined by single crystal x-ray crystallographic analysis. Keywords: X-ray crystallography; Substituted heptacyclopentadecan-3-one. (Reprints).

DESCRIPTORS: (U) \*KETONES, \*CYCLOPENTANES, \*BENZYL RADICALS, X RAYS, REPRINTS, CRYSTALLOGRAPHY.

IDENTIFIERS: (U) Pentadecan one/benzoyloxyheptacyclo, PE61102F, WUAFOSR230382.

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AD-A194 391 8/11

STATE UNIV OF NEW YORK AT BINGHAMTON DEPT OF BIOLOGICAL SCIENCES

(U) Membrane Alterations Following Toxic Chemical Insult.

DESCRIPTIVE NOTE: Research progress rept. no. 3 (Final), 15 Jul 84-31 Jan 88,

MAR 88 11P

PERSONAL AUTHORS: Liss, Alan

CONTRACT NO. AFOSR-84-0153

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-88-0460

UNCLASSIFIED REPORT

ABSTRACT: (U) A procaryotic cell system was developed that can be used to determine the toxic action of chemicals acting at the level of the eucaryotic or procaryotic cytoplasmic membrane. Cell wall-less microbes known as mycoplasmas were used. In this current study, two perfluorinated fatty acids (C8 and C10) were found to inhibit the growth of the test mycoplasmas. Two apparent activities, cytotoxicity and cytolysis, were observed. At high concentrations (>10 mM) a detergent-like action was noted. At low concentrations (<10 mM) cell death was observed without detectable cell lysis. Altering the cell membrane (the presumed target of the toxic compounds) resulted in altered levels to toxicity. Similar results were obtained when human or murine B-cells were used as the target organism. The toxic action of the perfluorinated fatty acids apparently involves some interaction with the membrane of the cells being treated.

DESCRIPTORS: (U) \*FATTY ACIDS, \*MEMBRANES(BIOLOGY), \*TOXICITY, \*FLUORINATED HYDROCARBONS, CELLS(BIOLOGY), CHEMICALS, CONCENTRATION(Composition), CYTOLOGY, DEATH, FLUORINATION, HIGH RATE, EXPOSURE(PHYSIOLOGY), PHYSIOLOGICAL EFFECTS, TOXIC TOLERANCES, CYTOPLASM.

IDENTIFIERS: (U) Procorytotoe, Eucaryotoe,

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Mycoplasmataceae, Cytoplasmic membrane, Perfluorinated fatty acids, WUAFOSR2312AS, PEG1102F.

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Neural Dynamics of Attentionally Modulated Pavlovian Conditioning: Blocking, Interstimulus Interval, and Secondary Reinforcement.

DEC 87

PERSONAL AUTHORS: Grossberg, Stephen; Levine, Daniel S.

CONTRACT NO. F49620-88-C-0037, DAAG29-85-K-0085

PROJECT NO. 2304

TASK NO. AN

MONITOR: AFOSR, ARO  
TR-88-0385, 21388.21-MA

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Applied Optics, v26 p5015-5030, 1 Dec 87.

ABSTRACT: (U) Selective information processing in neural networks is studied through computer simulations of Pavlovian conditioning data. The model reproduces properties of blocking, inverted-U in learning as a function of interstimulus interval, anticipatory conditioned responses, secondary reinforcement, attentional focusing by conditioned motivational feedback, and limited capacity short-term memory processing. Conditioning occurs from sensory to drive representations (conditioned reinforcer learning), from drive to sensory representations (incentive motivational learning), and from sensory to motor representations (habit learning). The conditionable pathways contain long-term memory traces that obey a non-Hebbian associative law. This model of vertebrate learning is compared with data and models of invertebrate learning. Predictions derived from about invertebrate learning, including data from Aplysia about facilitator neurons and data from Hermissenda about voltage-dependent C sub a (2+) currents. A prediction is stated about classical conditioning in all species, called the secondary conditioning alternative, and if confirmed would constitute an evolutionary invariant of learning.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION,  
\*CONDITIONING(LEARNING), \*CONDITIONED RESPONSE, APLYSIA,  
BLOCKING, DYNAMICS, EVOLUTION(GENERAL), FEEDBACK,  
INVARIANCE, INVERTEBRATES, MEMORY(PSYCHOLOGY), MODELS,  
MOTIVATION, NERVE CELLS, NERVOUS SYSTEM, NEURAL NETS,  
RETENTION(PSYCHOLOGY), SENSES(PHYSIOLOGY), VERTEBRATES,  
EXPERIMENTAL DATA, ATTENTION.

(U) Optical Bistable Behavior of a Planar Quasi-Waveguide  
Interferometer Made with a Conjugated Organic Polymer  
Film.

FEB 88 5P

PERSONAL AUTHORS: Singh, Bharu P.; Prasad, Paras N.

IDENTIFIERS: (U) PE61102F, WUAFOSR-2304AN.

REPORT NO. SUNY/AB/TR-15

CONTRACT NO. F49620-87-C-0042, F49620-87-C-0002

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-88-0423

UNCLASSIFIED REPORT

ABSTRACT: (U) Optical bistable behavior in a quasi-waveguide interferometer with the third-order nonlinearity of the guiding film of a soluble polydiacetylene (poly-48CMU) is demonstrated. This device shows input-output behavior analogous to that of a nonlinear Fabry-Perot etalon. The value of chi (3) for poly-48CMU estimated from the switching power is considerably higher than the earlier reported nonresonant values measured by other methods. Keywords include: optical bistable behavior of a planar quasi-waveguide interferometer made with a conjugated organic polymer film.

DESCRIPTORS: (U) \*POLYMERIC FILMS, \*INTERFEROMETERS, BEHAVIOR, BISTABLE DEVICES, FABRY PEROT INTERFEROMETERS, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, POWER, SWITCHING.

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A3.

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AD-A194 289 12/3

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) Weak Solution of the Langevin Equation on a Generalized Functional Space,

(U) Poisson Functionals of Markov Processes and Queueing Networks,

FEB 88 48P

DEC 87 29P

PERSONAL AUTHORS: Mitoma, Itaru

PERSONAL AUTHORS: Serfozo, R. F.

REPORT NO. TR-222

REPORT NO. TR-218

CONTRACT NO. F49620-85-C-0144

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR  
TR-88-0351MONITOR: AFOSR  
TR-88-0352

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Contents: 1) Introduction; 2) Existence and Uniqueness for Solutions of the Langevin Equations; 3) Proof of Lemma 1; 4) Generation of the Kolmogorov Evolution Operator; 5) Central Limit Theorem for a Lattice System of Interacting Diffusions. Keywords: Weak solution, Frechet derivative.

ABSTRACT: (U) The author presents conditions under which a point process of certain jump times of a Markov process is a Poisson process. One result is that if the Markov process is stationary and the compensator of the point process in reverse time has a constant intensity  $\lambda$ , then the point process is Poisson with rate  $\lambda$ . A classical example is that the output flow from a M/M/1 queueing system is Poisson. Also presented are similar Poisson characterizations of more general marked point process functionals of a Markov process. These results yield easy-to-use criteria for a collection of such processes to be multi-variate Poisson or marked Poisson with a specified dependence or independence. This document gives several applications to queueing systems, and indicates how the results extend to functionals of non-Markovian processes.

DESCRIPTORS: (U) \*NORMAL DISTRIBUTION, EQUATIONS, LIMITATIONS, SOLUTIONS(GENERAL), THEOREMS, STOCHASTIC PROCESSES, DIFFUSION, HILBERT SPACE.

DESCRIPTORS: (U) \*MARKOV PROCESSES, \*POISSON DENSITY FUNCTIONS, \*QUEUEING THEORY, \*POINT THEOREM, FLOW, INTENSITY, MULTIVARIATE ANALYSIS, NETWORKS, OUTPUT, POISSON EQUATION, REVERSIBLE, TIME, MATHEMATICAL FILTERS.

IDENTIFIERS: (U) \*Langevin equation, WJAFDSR2304A5, PE81102F.

IDENTIFIERS: (U) \*Jump processes, M/M/1 Queues, WJAFDSR2304A5, PE81102F.

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SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

(U) Flow Dynamics Stimulated by Hairpin-Like Vortices in  
Initially Laminar Boundary Layers.

DESCRIPTIVE NOTE: Annual rept. 1 Feb 87-31 Jan 88.

MAR 88 61P

PERSONAL AUTHORS: Liu, N. S.; Shamroth, S. J.; McDonald,  
H.

REPORT NO. SRA-R88-910016-A

CONTRACT NO. F49620-88-C-0028

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-88-0473

UNCLASSIFIED REPORT

ABSTRACT: (U) Time-marching spatial simulations of flow events stimulated by hairpin-like vortices in the near-wall region of initially laminar boundary layers are in progress. The behavior characteristics and the underlying physical mechanisms are being examined by using three distinct but related methods of analysis. The results presented in this report are the kinematic and dynamic states in a plane at a given instant. The spatial distributions of various flow quantities over a cross-section of the streamwise vortex have been examined and interpreted. These quantities are: translational velocity, vorticity, production of vorticity due to straining, viscous diffusion of vorticity, dissipation, static pressure and viscous stress tensor. Such a local, instantaneous analysis forms the basis for a global temporal analysis; its results will be presented in the final report. Keywords: Organized flow events; Direct numerical simulation.

DESCRIPTORS: (U) \*TURBULENT FLOW, \*VORTICES, \*BOUNDARY LAYER FLOW, DIFFUSION, DYNAMICS, LAMINAR BOUNDARY LAYER, MATHEMATICAL MODELS, NUMERICAL ANALYSIS, PHYSICAL PROPERTIES, PRODUCTION, QUANTITY, SPATIAL DISTRIBUTION,

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DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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OREGON STATE UNIV NEWPORT OR HATFIELD MARINE SCIENCE CENTER

(U) Parallel Processing and Learning in Simple Systems.

DESCRIPTIVE NOTE: Annual rept. 10 Jan 87-9 Jan 88,

MAR 88 4P

PERSONAL AUTHORS: Mpitso, George J.

CONTRACT NO. AFOSR-88-0075

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-88-0518

## UNCLASSIFIED REPORT

ABSTRACT: (U) To date it has been demonstrated that an experimental animal, the sea slug *Pleurobranchaea*, is capable of one-trial food-aversion learning, and that the muscarinic antagonist scopolamine in low doses causes an enhancement of learning. Pharmacologic binding studies using a new, 125 sub I-form of quinuclidinyl benzilate, in addition to studies using the 3 sub H-form of this ligand, have uncovered not only the classical types of muscarinic receptors that are typical of vertebrate cortex, but also a new form that is not found in other invertebrates that we have tested. Usually muscarinic receptors are found in low densities in invertebrate animal's neural membranes, but the density of the new form in this the classic receptors in mammalian cortex. Neurophysiological studies of individual neurons in small groups of identifiable neurons have shown that their activity is variable, as is the behavior that they take part in generating, and that the variability fits the definition of low-dimensional chaos. Findings show that such variability is an important feature of the emergence of adaptive responses arising from parallel, distributed neural networks in biological systems.

DESCRIPTORS: (U) \*LEARNING, \*NEUROPHYSIOLOGY, \*PARALLEL PROCESSING, ADAPTIVE SYSTEMS, ANIMALS, BIOLOGY, DOSE RATE,

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UNCLASSIFIED

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INVERTEBRATES, LABORATORY ANIMALS, LOW DENSITY, LOW RATE, MAMMALS, MEMBRANES, MUSCARINE, NERVE CELLS, NERVOUS SYSTEM, NEURAL NETS, OPTIMIZATION, PHARMACOLOGY, RECEPTION, RESPONSE, SCOPOLAMINE, VERTEBRATES.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2312A1.



## UNCLASSIFIED

DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A194 250 12/3

AD-A194 237 6/4 20/3

HONEYWELL SYSTEMS AND RESEARCH CENTER MINNEAPOLIS MN

NEW YORK UNIV NY NEUROMAGNETISM LAB

(U) Robust Control of Multivariable and Large Scale Systems.

(U) Cryosquid: A SQUID-Based Magnetic Field Sensor.

DESCRIPTIVE NOTE: Final rept. Oct 85-Mar 88,

DESCRIPTIVE NOTE: Technical rept. no. 3 (Final), 15 Aug 84-30 Nov 87,

MAR 88 117P

MAR 88 16P

PERSONAL AUTHORS: Packard, Andrew; Doyle, John C.

PERSONAL AUTHORS: Williamson, S. J.; Kaufman, Lloyd

REPORT NO. 88SRC11

CONTRACT NO. AFOSR-84-0313

CONTRACT NO. F49620-88-C-0001

PROJECT NO. 2304

PROJECT NO. 2917

TASK NO. A1

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR  
TR-88-0461

TR-88-0450

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This report gives fairly complete introduction to the Structured Singular Value ( $\mu$ ) and detail some of the latest results. The  $\mu$ -based methods discussed here have proven to be useful for analyzing the performance and robustness properties of linear feedback systems. This report also describes the recent nonlinear extensions. A description is given for how parametric uncertainty in state space models can be rearranged into the  $\mu$  framework. The theories for computation of the upper and lower bounds on  $\mu$  are developed. The relationships between the upper bound and  $\mu$  for various block structures are explored. The extensions of the  $\mu$ -based methods to time-varying and nonlinear controllers are outlined. Keywords: Linear fractional transformation; Optimal control; Difference equations.

DESCRIPTORS: (U) \*FEEDBACK, \*LINEAR SYSTEMS, \*MULTIVARIATE ANALYSIS, CONTROL, DIFFERENCE EQUATIONS, MATHEMATICAL MODELS, NONLINEAR SYSTEMS, OPTIMIZATION.

IDENTIFIERS: (U) Robustness, PE81102F, WJAFOSR2304A1.

AD-A194 250

AD-A194 237

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ABSTRACT: (U) A new type of neuromagnetometer has been developed to enhance the capability for measuring the magnetic field of the human brain. This system - known as CryoSQUID - results from the marriage of two advanced technologies: a refrigerator incorporating closed-cycle operation of a pair of cryocoolers and a sensor incorporating the superconducting quantum interference device (SQUID). The apparatus is relatively small and requires no supply of liquid helium for initial cooling or operation. Only a source of electrical power is needed. Each sensor relies on a detection coil wound in the geometry of a second-order gradiometer so as to minimize the effects of ambient magnetic noise found in typical unshielded environments. The intrinsic noise level of CryoSQUID is comparable to a magnetic field sensitivity of 20 femtoTesla within a one-hertz bandwidth. Residual noise at 1.2 Hz and its harmonics, contributed by the displacer in the Gifford-McMahon cooler, is virtually eliminated in real time by an adaptive filter run on a personal computer.

DESCRIPTORS: (U) \*AMBIENT NOISE, \*BRAIN, \*INTERFERENCE, \*MAGNETIC FIELDS, \*REFRIGERATION SYSTEMS, \*SUPERCONDUCTIVITY, ADAPTIVE FILTERS, CLOSED CYCLE SYSTEMS, COILS, COOLING, COOLING AND VENTILATING EQUIPMENT, CRYOGENICS, DETECTION, ELECTRIC POWER,

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A194 236 7/3 7/8

ENVIRONMENTS, HARMONICS, HUMANS, LIQUID HELIUM, MAGNETIC PROPERTIES, MARRIAGE, MICROCOMPUTERS, NOISE, OPERATION, POWER SUPPLIES, QUANTUM THEORY, REAL TIME, RESIDUALS, SENSITIVITY, SHIELDING.

ILLINOIS UNIV AT CHICAGO CIRCLE DEPT OF CHEMISTRY  
(U) Polyazidoesters as Energetic Polymers and Copolymer Components with Fluoro Derivatives.

IDENTIFIERS: (U) WJAFOSR2817A4, PE81102F.

DESCRIPTIVE NOTE: Final rept. 1 Nov 84-31 Nov 87.

APR 88 18P

PERSONAL AUTHORS: Moriarty, Robert M.

CONTRACT NO. AFOSR-85-0024

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-88-0465

UNCLASSIFIED REPORT

ABSTRACT: (U) 4,4'-Diazidodiphenylpolyester was synthesized by ozonolysis of 4,4'-bis (acetylamino) benzoin. By an analogous series of steps a monoazido analog was synthesized. A substituted cubyl polyester was synthesized via a multistep synthesis. A novel and versatile method was discovered for the synthesis of vicinal diazides. Structural and mechanistic implications derived from this work are discussed.

DESCRIPTORS: (U) \*POLYMERS, \*ESTERS, BENZOIN, ENERGETIC PROPERTIES, COPOLYMERS.

IDENTIFIERS: (U) \*Polyazidoesters, WJAFOSR2303B2, PE81102F.

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## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A194 230 7/2 7/4

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF  
AEROSPACE ENGINEERING

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Unsteady Water Channel.

(U) Identification and Analysis of the D' yields A'  
Transition in the Emission Spectrum of C12.

DESCRIPTIVE NOTE: Final rept. Dec 84-Dec 87.

MAR 87 7P

MAR 88 15P

PERSONAL AUTHORS: Chakraborty, Dilip K.; Tellinghuisen,  
Patricia C.; Guo, Baochuan; Tellinghuisen, Joel

PERSONAL AUTHORS: Ho, Chih-Ming

CONTRACT NO. AFOSR-83-0110

CONTRACT NO. AFOSR-85-0084

PROJECT NO. 2303

PROJECT NO. 2917

TASK NO. 81

TASK NO. A1

MONITOR: AFOSR  
TR-88-0497

TR-88-0497

TR-88-0488

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) When an airplane undergoes maneuvering, the motion includes many modes: pitching, plunging, translation, acceleration and deceleration. The aerodynamics of the first three types of motion are well-documented. The effects of acceleration and deceleration on the aerodynamic forces of a wing have not been explored in depth because a specially designed unsteady testing facility is necessary. The present water channel is able to provide a wide variety of free stream conditions. The test section of the water channel measures 18-in. by 18-in. and has a maximum flow rate of 3 ft/sec. In addition, a rotating gate provides programmable unsteady flow velocities.

DESCRIPTORS: (U) \*UNSTEADY FLOW, \*WATER CHANNEL TEST FACILITIES, ACCELERATION, AERODYNAMIC FORCES, AERODYNAMICS, COMPUTER PROGRAMMING, DECELERATION, FLOW RATE, FREE STREAM, ROTATION, TEST EQUIPMENT, VELOCITY, WINGS, FLIGHT MANEUVERS.

IDENTIFIERS: (U) WUAFOSR2917A1, PE81102F.

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v134 n8 p565-570, 20 Mar 87.

ABSTRACT: (U) The emission spectrum of chlorine in argon is re-examined using Tesla discharge sources containing isotopically pure chlorine 35 and chlorine 37. Earlier speculation that the dominant emission near 2580 A is due to the D' 2 sub g (3 P sub 2) yields A' 2 sub u(3 pi) transition is confirmed. A weaker band system in the same spectral region is tentatively assigned to beta 1 sub g (3 P sub 2) yields A 1 sub u (3 pi).

DESCRIPTORS: (U) \*CHLORINE, \*EMISSION SPECTRA, ARGON, REGIONS, REPRINTS, SOURCES, SPECTRA, YIELD.

IDENTIFIERS: (U) WUAFOSR2303B1, PE81102F.

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

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SOCIETY FOR INDUSTRIAL AND APPLIED MATHEMATICS  
PHILADELPHIA PA

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) SIAM Workshop on Mathematics of Systems and Signal  
Processing Held in Stanford, California on 31 August-4  
September 1987.

(U) Preparation and Reactions of a Disilyne Synthon, 7,7'-  
bis(7-methyl-1,4,5,6-tetraphenyl-7-sila-2,3-benzo-  
norbornadiene),

MAR 88

DESCRIPTIVE NOTE: Final rept. 1 Jun 87-31 Jan 88.

PERSONAL AUTHORS: Sekiguchi, Akira; Zigler, Steven S.;  
Haller, Kenneth J.; West, Robert

MAR 88 15P

PERSONAL AUTHORS: Boyd, Stephen; Kallath, Thomas

CONTRACT NO. DAAL03-87-G-0419, AFOSR-87-0352

MONITOR: ARO, AFOSR  
25393.1-MA-SDI, TR-88-0588

TASK NO. 82

MONITOR: AFOSR  
TR-88-0412

UNCLASSIFIED REPORT

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ABSTRACT: (U) The workshop brought together researchers  
on a variety of topics, in signal processing, control and  
system theory, that share a common mathematical  
background. The emphasis of the workshop was on trying to  
uncover connections between the different fields, rather  
than on elaborating the fields themselves. About fifty  
leading engineers and mathematicians from various  
countries attended the workshop along with several local  
participants from U.C. Berkeley and from Stanford. There  
were twenty major presentations, prepared in consultation  
with the organizers to ensure continuity and connection  
to the overall topics of the workshop; there were on  
parallel sessions. Time was also allotted for over a  
dozen short presentations by participants who wished to  
offer extended comments, to share recent results, or  
present open problems.

DESCRIPTORS: (U) \*MATHEMATICS, \*SIGNAL PROCESSING,  
\*SYSTEMS ANALYSIS, BACKGROUND, THEORY.

SUPPLEMENTARY NOTE: Pub. in Recueil des Travaux Chimiques  
des Pays-Bas, v107 n3 p157-202 Mar 88.

ABSTRACT: (U) Compounds containing triple bonds between  
silicon atoms (disilynes) are the subject of current  
interest. However only two reports have appeared in which  
a disilyne has been implicated as a reaction intermediate.  
7,7'-bis(7-methyl-1,4,5,6-tetraphenyl-7-sila-2,3-benzo-  
norbornadiene) was prepared by condensing a bis(silole) 1  
with benzene. Thermolysis of 2 in the presence of  
anthracene, 9,10-dimethylantracene (DMA), 2,3-dimethyl-  
butadiene, and two acetylenes is described in detail. X-  
ray structures for the anthracene and DMA adducts are  
reported.

DESCRIPTORS: (U) \*ANTHRACENES, \*DIENES,  
\*SYNTHESIS(CHEMISTRY), \*SILICON COMPOUNDS, ACETYLENES,  
ATOMS, CHEMICAL BONDS, REPRINTS, PHENYL RADICALS, BENZENE,  
METHYL RADICALS.

IDENTIFIERS: (U) \*Norbornadienes, PE81102F,  
WUAFOSR230382.

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## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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## WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

## WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) 29Si Nuclear Magnetic Resonance of Dialkylpolysilanes.

(U) 29Si Nuclear Magnetic Resonance of Dimethyl and Phenylmethyl Containing Polysilanes.

88

9P

88

13P

PERSONAL AUTHORS: Wolff, Andrew R.; Mixka, Jim; West, Robert

PERSONAL AUTHORS: Wolff, Andrew R.; Nozue, Ikuro; Maxka, Jim; West, Robert

CONTRACT NO. F49620-86-C-0010

CONTRACT NO. F49620-86-C-0010

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR  
TR-88-0508MONITOR: AFOSR  
TR-88-0505

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Polymer Science, Pt. A: Polymer Chemistry, v26 p713-720 1988.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Polymer Science: Pt. A: Polymer Chemistry, v26 p701-712 1988.

ABSTRACT: (U) The silicon-29 nuclear magnetic resonance spectra of a number of dialkyl- and alkylmethylpolysilanes are reported. Polysilanes composed of asymmetrically substituted silylanes (i.e., alkylmethylsilylenes exhibited very broad resonance lines attributed to diastereomeric chemical shifts of stereogenic silylanes alpha and beta to the observed nucleus. Symmetrically substituted polysilanes showed a single narrow peak. The Si chemical shifts for these polysilanes decrease with increasing steric bulk of the substituents, varying inversely with the electronic excitation energy.

ABSTRACT: (U) The Si-NMR spectra are reported for poly(methylphenylsilylene), 1, poly(1,1,2-trimethyl-2-phenyldisilene) 2, two samples of poly(dimethylsilylene, 3a and 3b, and poly(phenylmethylsilylene-co-n-hexylmethylsilylene), 4. The spectra of 3a, 3b, and 4 indicate that these polymers contain blocklike regions with considerable segregation of REMESi and PMeSi groups. The spectrum of 2 shows no evidence for stereospecific or regiospecific polymerization. The preparation of 2 from 1, 1,2-trimethyl-2-phenylchlorosilane is also described. Reprints

DESCRIPTORS: (U) \*POLYSILANES, \*NUCLEAR MAGNETIC RESONANCE, CHEMICAL SHIFTS, ELECTRON ENERGY, ELECTRONS, EXCITATION, PEAK VALUES, REPRINTS, SUBSTITUTES.

DESCRIPTORS: (U) \*POLYSILANES, \*PHENYL RADICALS, \*METHYL RADICALS, \*NUCLEAR MAGNETIC RESONANCE, POLYMERS, REPRINTS.

IDENTIFIERS: (U) PE61102F, WJAFOSR23082.

IDENTIFIERS: (U) PE61102F, WJAFOSR2303B2.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

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AD-A194 073 7/6

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INSTUNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INST(U) Regio- and Stereospecific 1,4-Polymerization of 2-  
(Triethylsilyl)-1,3-butadiene,(U) Stereospecific 1,4-Polymerization of 2,3-  
bis(trimethylsilyl)-1,3-butadiene,

88

88 8P

PERSONAL AUTHORS: Ding, Xi-Xiang; Weber, William P.

PERSONAL AUTHORS: Ding, Xi-Xiang; Weber, William P.

CONTRACT NO. AFOSR-88-0042

CONTRACT NO. AFOSR-88-0042

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR  
TR-88-0502MONITOR: AFOSR  
TR-88-0481

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Macromolecules, V21 n2 p530-  
532 1988.SUPPLEMENTARY NOTE: Pub. in Jnl. of Organometallic  
Chemistry, v341 p267-271 1988.

ABSTRACT: (U) There is considerable interest in stereoregular polymerization of 1,3-diene monomers. Anionic polymerization of isoprene initiated by alkyl lithium reagents in hydrocarbon solvents such as cyclohexane yields polyisoprene of narrow molecular weight distribution whose microstructure has been shown by IR, <sup>1</sup>H NMR, and <sup>13</sup>C NMR to be predominantly cis-1,4 (approx. 80%). However, appreciable amounts of trans-1,4 (approx. 15%) and 3,4 (approx. 5%) units are also present. Anionic polymerization of isoprene in the presence of donor solvents such as ether and THF leads to a polymer whose microstructure is predominantly 3,4 (approx. 80%). Thus, the anionic polymerization of isoprene is regio- and stereoselective but neither regio- nor stereospecific.

DESCRIPTORS: (U) \*BUTADIENES, \*POLYMERIZATION, ANIONS, CYCLOHEXANES, DISTRIBUTION, ISOPRENE, ETHYL RADICALS, SILICON COMPOUNDS, HEXANES, MICROSTRUCTURE, MOLECULAR WEIGHT, POLYMERS, REPRINTS, SOLVENTS, STEREOSPECIFIC POLYMERS, YIELD.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B2.

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## UNCLASSIFIED

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A194 070 12/1

AD-A194 069 7/4

RUTGERS - THE STATE UNIV NEW BRUNSWICK N J DEPT OF  
MATHEMATICS

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

(U) Finite-Dimensional Open-Loop Control Generators for  
Non-Linear Systems,

88

21P

88

6P

PERSONAL AUTHORS: Sontag, Eduardo D.

PERSONAL AUTHORS: Alvey, Mark D.; Yates, John T., Jr

CONTRACT NO. AFOSR-85-0247

CONTRACT NO. AFOSR-86-0107

PROJECT NO. 2304

PROJECT NO. 2303

MONITOR: AFOSR  
TR-88-0406MONITOR: AFOSR  
TR-88-0414

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Jnl. of Control,  
v47 n2 p537-558 1988.SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical  
Society, v110 n6 p1782-1788 1988.

ABSTRACT: (U) This reprint concerns itself with the existence of open-loop control generators for nonlinear (continuous-time) systems. The main result is that, under relatively mild assumptions on the original system, and for each fixed compact subset of the state space, there always exists one such generator. This is a new system with the property that the controls it produces are sufficiently rich to preserve complete controllability along nonsingular trajectories. General results are also given on the continuity and differentiability of the input-to-state mapping for various p-norms on controls, as well as a comparison of various non-linear controllability notions.

DESCRIPTORS: (U) , GENERATORS, NONLINEAR SYSTEMS, CONTROL SYSTEMS, REPRINTS, SIZES(DIMENSIONS), TRAJECTORIES.

IDENTIFIERS: (U) PEG1102F.

DESCRIPTORS: (U) \*CHEMISORPTION, \*FLUORIDES, \*PHOSPHORUS COMPOUNDS, ATOMS, AUGER ELECTRON SPECTROSCOPY, ELECTRON DIFFRACTION, LIGANDS, LOW ENERGY, NICKEL, PHOSPHORUS, REPRINTS, SURFACES, TEMPERATURE, TRANSITION METALS, CHEMICAL BONDS.

IDENTIFIERS: (U) ESDIAD(Electron Stimulated Desorption

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on angular Distribution), PE81102F, WUAFOSR2303A2.

PITTSBURGH UNIV PA INSY FOR COMPUTATIONAL MATHEMATICS AND APPLICATIONS

(U) The Reduced Basis Method for Initial Value Problems,

DEC 87 12P

PERSONAL AUTHORS: Posching, T. A.; Lee, M. L.

CONTRACT NO. AFOSR-84-0131

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0470

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in SIAM Jnl. of Numerical Analysis, v24 n8 p1277-1287 Dec 87.

ABSTRACT: (U) This paper deals with the application of the reduced basis method to the initial value problem of ordinary differential equations. A global approximation of the true solution curve is defined in terms of a sequence of reduced basis curves. Error bounds are established and these lead to order estimates for specific choices of reduced basis subspaces. The effects of numerical integration are then incorporated into the estimates. A numerical study is included. Keywords: Initial value problems; Projection methods; Reprints.

DESCRIPTORS: (U) \*NUMERICAL ANALYSIS, \*BOUNDARY VALUE PROBLEMS, DIFFERENTIAL EQUATIONS, ESTIMATES, GLOBAL, GRAPHS, NUMERICAL INTEGRATION, REPRINTS, SOLUTIONS(GENERAL).

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1.

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MCDONNELL DOUGLAS RESEARCH LABS ST LOUIS MO

(U) Three-Dimensional Vortex Interactions.

DESCRIPTIVE NOTE: Annual technical rept. 1 Sep 88-31 Aug 87.

JAN 88 35P

PERSONAL AUTHORS: Kibens, Valdis; Wlezien, Richard W.; Roos, Frederick W.; Kegeles, Jerome T.

REPORT NO. MDC-QA005

CONTRACT NO. F49820-88-C-0090

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-88-0484

UNCLASSIFIED REPORT

ABSTRACT: (U) Three-dimensional vortex interactions were investigated in jets with slanted, indeterminate origin exit nozzles, and in mixing layers behind a splitter plate with a swept trailing edge. Flow visualization images were quantitatively processed to characterize complex three dimensional vortex interactions in non axisymmetric jets. Phase conditioned pulsed laser sheet illumination was used to obtain a series of sectional images while rotating the asymmetric nozzle. The sectional images were recombined into an unwrapped representation of the developing vortex systems in the shear layer. Partial pairing of sections of adjacent vortex systems was shown to be responsible for asymmetric shear layer growth. Flow visualization in the flow behind the swept trailing edge showed that two families of instability waves can develop with different orientations with respect to the trailing edge angle. Excitation was shown to enhance waves with orientation parallel to the trailing edge or perpendicular to the mean flow direction, depending on excitation frequency. Streamwise wavelengths of the two wave families were related by their angular separation. Keywords: Fluid mechanics; Shear layers; Jet flows; Passive control; Active control; Image processing;

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AD-A194 017 20/4

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERINGPENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING(U) On the Pseudo-Linearization Problem for Nonlinear  
Systems.(U) Computation of Low Speed Viscous Flows with Heat  
Addition.

DESCRIPTIVE NOTE: Technical rept. 1 Mar 87-29 Feb 88.

86 8P

MAR 88 12P

PERSONAL AUTHORS: Wang, Jianliang; Rugh, Wilson J.

PERSONAL AUTHORS: Hosangadi, Ashvin; Werkle, Charles L.

REPORT NO. JHU/ECE-87-18

CONTRACT NO. AFOSR-84-0048

CONTRACT NO. AFOSR-87-0101

PROJECT NO. 2308

PROJECT NO. 2304

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR  
TR-88-0438MONITOR: AFOSR  
TR-88-0468

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Based on well-known results for linear systems, an alternate treatment of the pseudo linearization problem of Raboulet and Champetier is given. Sufficient conditions for pseudo-linearization are obtained in the general case, and these are shown to be satisfied under mild hypotheses by systems with one or two inputs. Advantages of the new approach include the simplicity of the derivation, and a more explicit representation for a pseudo-linearizing transformation. Keywords: Nonlinear control systems; Control theory.

ABSTRACT: (U) The use of implicit time-dependent schemes for the numerical solution of low speed, low Reynolds number flows with heat addition is investigated.

Stability analyses show that the errors introduced by approximate factorization give rise to instability at Reynolds numbers around 100. Specifically, it is the cross-derivative errors between the viscous and inviscid terms that cause problems. When exact inversion techniques are used, the system becomes strongly stable and numerical experiments show rapid convergence. Comparisons of outflow boundary conditions give identical results over a wide range of Reynolds numbers when buoyancy is omitted, but with buoyance present the inviscid boundary conditions are unstable. Flowfield results for a range of low Reynolds conditions with and without buoyancy are given to show the manner in which the flowfield changes as these physical parameters are varied.

DESCRIPTORS: (U) \*CONTROL SYSTEMS, \*CONTROL THEORY, \*NONLINEAR SYSTEMS, HYPOTHESES, LINEAR SYSTEMS, SYSTEMS APPROACH, LINEARITY, PROBLEM SOLVING, CLOSED LOOP SYSTEMS.

IDENTIFIERS: (U) EP61102F, WUAFOSR2304A1.

DESCRIPTORS: (U) \*VISCIOUS FLOW, \*HEAT FLUX, ADDITION, BOUNDARIES, BUOYANCY, CONVERGENCE, FLOW FIELDS, FORMULATIONS, HEAT, INVERSION, INVISCID FLOW, LOW VELOCITY, NUMERICAL ANALYSIS, NUMERICAL METHODS AND PROCEDURES, PHYSICAL PROPERTIES, RANGE(EXTREMES), REYNOLDS NUMBER, SOLUTIONS(GENERAL), STABILITY, TIME DEPENDENCE, VISCOSITY, THERMAL PROPERTIES.

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IDENTIFIERS: (U) PE61102F, WJAFOSR2308A1.

OKLAHOMA UNIV NORMAN DEPT OF CHEMISTRY

(U) Computational Studies of Heterogeneous Reactions of  
SiH<sub>2</sub> on Si(111) Surfaces,

88 28P

PERSONAL AUTHORS: Agrawal, Paras M.; Thompson, Donald L.;  
Raff, Lionel M.

CONTRACT NO. AFOSR-88-0043

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-88-0504

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science, v195 p283-  
306 1988.

ABSTRACT: (U) The dynamics of sticking and decomposition of SiH<sub>2</sub> on Si(111) surfaces have been investigated using classical trajectories on a potential-energy surface fitted to ab initio and semiempirical results for bond energies, structure, and barrier heights and to the available experimental data for Si-H bond energies and barrier heights. SiH<sub>2</sub> sticking probabilities are found to be unity for all temperatures and incident translational energies investigated. The reaction exothermicity of chemisorption is primarily dissipated into the phonon modes of the lattice. Chemisorption results in a tetrahedrally bonded structure. Direct hydrogen abstraction by the surface prior to chemisorption is never observed although it is an energetically open reaction channel. SiH<sub>2</sub> decomposition on the Si(111) surface occurs via two modes: direct molecular hydrogen elimination and a two-step sequence in which successive hydrogen atoms dissociate to surface binding sites in a plane perpendicular to the \*Si-\* plane. First-order rate coefficients for each elementary reaction in the two decomposition modes are obtained from decay plots of the trajectory data.

DESCRIPTORS: (U) \*SILANES, \*SURFACE REACTIONS, ADHESION,

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AD-A194 016

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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ATOMS, CHEMICAL BONDS, CHEMISORPTION, COEFFICIENTS, COMPUTATIONS, DECAY, DECOMPOSITION, DYNAMICS, ELIMINATION REACTIONS, ENERGY, ENERGY TRANSFER, EXPERIMENTAL DATA, HETEROGENEITY, HYDROGEN, MOLECULES, PHONONS, PLOTTING, REACTION KINETICS, SILICON, CRYSTALS, THIN FILMS, REPRINTS, SEQUENCES, SURFACE PROPERTIES, TEMPERATURE, TRAJECTORIES.

NORTH TEXAS STATE UNIV DENTON DEPT OF CHEMISTRY

(U) Reductive Amination of Pentacyclo(b.4.0.0(2.6).0(3,10).0(5.9)undecane-8,11-dione,

88

7P

PERSONAL AUTHORS: Marchand, Alan P.; Dave, Paritosh R.; Satyanarayana, N.; Arney, Benny E., Jr

CONTRACT NO. AFOSR-84-0085

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-88-0490

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, V53 n5 p1088-1092 1988.

ABSTRACT: (U) Sodium cyanoborohydride is a highly selective reducing agent which is stable to pH 3 in aqueous acidic solution. Its ability to preferentially reduce iminium ions in the presence of ketone or aldehyde carbonyl groups renders it suitable for use as a reagent in the reductive amination of aldehydes and ketones. As part of an ongoing program that is concerned with the synthesis and chemistry of new, substituted pentacyclo undecanes we have investigated the reductive amination of the title compound by using sodium cyanoborohydride in the presence of ammonium bromide. In our hands, the reaction of 1 with sodium cyanoborohydride in the presence of ammonium bromide at pH 7.5-8.0 afforded a mixture of three products (2-4, Scheme I). One product, 2, could be isolated in pure form via careful fractional crystallization of the product mixture (see Experimental Section). However, the remaining mixture of cage diamine 3 and cage diol 4 proved to be intractable.

DESCRIPTORS: (U) \*DECANES, \*REDUCTION(CHEMISTRY), ACIDS, AMMONIUM COMPOUNDS, BROMIDES, CHEMICAL AGENTS, IONS, KETONES, MIXTURES, REPRINTS, CYCLIC COMPOUNDS, BORON HYDRIDES, SODIUM COMPOUNDS, SOLUTIONS(MIXTURES), SYNTHESIS(CHEMISTRY), WATER.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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IDENTIFIERS: (U) \*Amination, Sodium cyanoborohydride,  
Hydride/sodium cyanoboro, PE61102F, WUAFOSR230382.  
NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY  
(U) Substituted Silabenzenes,

88 13P

PERSONAL AUTHORS: Baldrige, Kim K.; Gordon, Mark S.

CONTRACT NO. AFOSR-87-0049, NSF-CHE88-40771

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-88-0480

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organometallics, v7 n1 p144-  
155 1988.

ABSTRACT: (U) Ab initio calculations have been carried out on a group of substituted monosilabenzenes. Twelve different substituents are considered (Cl, F, SH, OH, PH<sub>2</sub>, NH<sub>2</sub>, CH<sub>3</sub>, SiH<sub>3</sub>, NO<sub>2</sub>, CN, COOH) each placed in the four unique positions on the ring. The relative energies and stabilities, aromaticities (as measured by bond separation reactions), electron density distributions, and dipole moments of these compounds are considered and discussed with the aid of density difference plots.

DESCRIPTORS: (U) \*BENZENE, \*SILICON COMPOUNDS, \*SUBSTITUTION REACTIONS, DENSITY, CHEMICAL BONDS, DIPOLE MOMENTS, DISTRIBUTION, ELECTRON DENSITY, ELECTRONS, ENERGY, PLOTTING, REPRINTS, SEPARATION, STABILITY.

IDENTIFIERS: (U) PE61102F, WUAFOSR230383.

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NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) Potential Primary Pyrolysis Processes of Methylsilane.

(U) Variance Function Estimation,

DEC 87

8P

DEC 87

15P

PERSONAL AUTHORS: Gordon, Mark S.; Truong, Thanh N.

PERSONAL AUTHORS: Davidian, M.; Carroll, R. J.

CONTRACT NO. AFOSR-87-0049, NSF-CHE86-40771

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. B3

TASK NO. A5

MONITOR: AFOSR  
TR-88-0482MONITOR: AFOSR  
TR-88-0483

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters,  
v142 n12 p110-114, 4 Dec 87.SUPPLEMENTARY NOTE: Pub. in Jnl. of the American  
Statistical Assn., v82 p1079-1081 Dec 87.

ABSTRACT: (U) The relative energetics for eight competing decomposition reactions of methylsilane are evaluated using full fourth-order (MP4) perturbation theory and the combined McLean-Chandler/6-311G basis set augmented by polarization functions on all atoms. The lowest energy processes are predicted to be the 1,1-elimination of molecular hydrogen to form methylsilylene and the extrusion of silylene to form methane. The 1,2-H2 elimination is predicted to be much higher energy process however unlike disilane because of the high barrier to the methylsilylene-silacene isomerization the lowest energy route to the latter isomer is still likely to be the direct 1,2-elimination.

DESCRIPTORS: (U) \*PYROLYSIS, \*SILANES, \*METHYL RADICALS, ATOMS, BARRIERS, ENERGETIC PROPERTIES, ENERGY, FUNCTIONS, METHANE, PERTURBATION THEORY, POLARIZATION, ELIMINATION REACTIONS, REPRINTS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B3.

ABSTRACT: (U) The heteroscedasticity is modeled as a function of the covariates or the regression and other structural parameters. A general theory is developed for variance function estimation, focusing on estimation of the structural parameters and including most methods in common use in our development. The general qualitative conclusions are these. First, most variance function estimation procedures can be looked upon as regressions with 'response' being transformation of absolute residuals from a preliminary fit or sample standard deviations from replicates at a design point. Our conclusion is that the former is typically more efficient, but not uniformly so. Second, for variance function estimates based on transformations of absolute residuals, the efficiency is a monotone function of the efficiency of the fit from which the residuals are formed, at least for symmetric errors. One should iterate so that residuals are based on generalized least squares. Finally, robustness issues are of even more importance here than in estimation of a regression function for the mean. The loss of efficiency of the standard method away from the normal distribution is much more rapid than in the regression problem.

DESCRIPTORS: (U) \*ESTIMATES, \*ANALYSIS OF VARIANCE, ERRORS, LEAST SQUARES METHOD, MONOTONE FUNCTIONS, NORMAL

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DISTRIBUTION, PARAMETERS, REGRESSION ANALYSIS, REPRINTS, RESIDUALS, STANDARD DEVIATION, STANDARDIZATION, SYMMETRY, THEORY, VARIATIONS, MATHEMATICAL MODELS, TRANSFORMATIONS(MATHEMATICS).

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF ELECTRICAL ENGINEERING AND COMPUTER S CIENCE

(U) Design of Nonlinear PID (Proportional-Integral-Derivative) Controllers.

IDENTIFIERS: (U) Heteroscedasticity, PE81102F, WJAFOSR2304A5.

OCT 87 8P

PERSONAL AUTHORS: Rugh, W. J.

CONTRACT NO. AFOSR-87-0101, \$AFOSR-83-0079

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0418

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in AIChE Jnl., V33 n10 p1738-1742 Oct 87.

ABSTRACT: (U) A family of linearizations is derived for a certain class of nonlinear systems using design by extended linearization. Attention is focused on a particular case: the design of nonlinear proportional integral derivative (PID) controllers based upon a parametrized version of the well known Ziegler Nichols tuning specifications. Keywords: Nonlinear control systems; Control theory.

DESCRIPTORS: (U) \*CONTROL SYSTEMS, \*CONTROL THEORY, \*NONLINEAR SYSTEMS, LINEARITY, REPRINTS, CLOSED LOOP SYSTEMS, SYSTEMS ENGINEERING.

IDENTIFIERS: (U) PID(Proportional Integral Derivative), PE81102F, WJAFOSR2304A1.

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AD-A193 969 9/1

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

TEXAS UNIV AT AUSTIN DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING(U) Photochemistry of Molecules Adsorbed on Alkali Ion  
Exchanged Zeolites. A 'Lebensraum' Effect on Product  
Formation.

87

5P

PERSONAL AUTHORS: Turro, Nicholas J.; Zhang, Zhenyu

PERSONAL AUTHORS: Lee, Hong-Gi; Arapostathis, A.; Marcus,  
Steven I.

CONTRACT NO. AFOSR-88-0043

CONTRACT NO. F49620-88-C-0045, AFOSR-88-0029

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. 82

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR  
TR-88-0101

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Tetrahedron Letters, v28 n48  
p5637-5640 1987.SUPPLEMENTARY NOTE: Pub. in International Jnl. of Control,  
v45 n5 p1803-1822 1987.

ABSTRACT: (U) The products of the photolysis of dibenzyl ketone adsorbed on faujasite zeolites are found to be a strong function of the Silicon/Aluminum composition of the zeolite and of the exchangeable cations associated with the internal framework. In summary, a very simple product analysis appears to be capable of reporting on the space available for rotational and diffusional motions of radical pairs produced in faujasite supercages. For a given Si/Al ratio, the lebensraum increases as the size of the mobile ions decreases, and, for a given ion, the lebensraum increases as the Si/Al ratio increases. This information, since it is derived from direct product analysis, should be pertinent to the understanding of catalytic action of faujasites, which represent industrial catalysts of wide use and versatility.

DESCRIPTORS: (U) \*PHOTOCHEMICAL REACTIONS, \*KETONES, \*BENZYL RADICALS, CATALYSTS, CATALYTIC CRACKING, CATIONS, INDUSTRIES, IONS, MOBILE, MOLECULES, MOTION, PHOTOLYSIS, RATIOS, REPRINTS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2303B2.

AD-A194 005

AD-A193 969

## UNCLASSIFIED

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ABSTRACT: (U) We characterize the equivalence of single-input single-output discrete-time nonlinear systems to linear ones, via a state-coordinate change and with or without feedback. Four cases are distinguished by allowing or disallowing feedback as well as by including the output map or not; the interdependence of these problems is analyzed. An important feature that distinguishes these discrete-time problems from the corresponding problem in continuous-time is that the state-coordinate transformation is here directly computable as a higher composition of the system and output maps. Finally, certain connections are made with the continuous-time case.

DESCRIPTORS: (U) \*LINEARITY, \*CONTROL SYSTEMS, DISCRETE DISTRIBUTION, MAPS, OUTPUT, TIME, REPRINTS, CASE STUDIES.

IDENTIFIERS: (U) WJAFOSR2304A1, PE81102F.



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TEXAS UNIV AT AUSTIN DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) On the Controllability of Piecewise-Linear  
Hypersurface Systems.(U) Vibrational Overlap Integrals between the Neutral and  
Ion States of NH<sub>3</sub> and ND<sub>3</sub>: Application to the  
Vibrational Dependence of the NH<sub>3</sub>+(v<sub>2</sub>) + NH<sub>3</sub>(0)  
Symmetric Charge Transfer Reaction.

87 9P

DESCRIPTIVE NOTE: Interim rept.,

PERSONAL AUTHORS: Lee, Kyun K.; Arapostathis, Aristotile

87 15P

CONTRACT NO. AFOSR-88-0029, NSF-ECS84-12100

PERSONAL AUTHORS: Ebata, Takayuki; Conaway, William E.;  
Zare, Richard N.

PROJECT NO. 2304

CONTRACT NO. F49620-88-C-0018

TASK NO. A1

MONITOR: AFOSR  
TR-88-0100

PROJECT NO. 2303

TASK NO. B1

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-88-0327

SUPPLEMENTARY NOTE: Pub. in Systems and Control Letters,  
v9 p89-98 1987.

UNCLASSIFIED REPORT

ABSTRACT: (U) This paper investigates the global controllability of piecewise-linear (hypersurface) systems, which are defined as control systems that are subject to affine dynamics on each of the components of a finite polyhedral partition. Various new tools are developed for the study of the problem including a classification of the facets of the polyhedra in the partition. Necessary and sufficient conditions for complete controllability are obtained via the study of a suitability defined controllability connection matrix of polyhedra. Keywords: Nonlinear systems; Discontinuous differential equations; Controllability.

DESCRIPTORS: (U) \*CONTROL THEORY, CONTROL SYSTEMS,  
DIFFERENTIAL EQUATIONS, NONLINEAR SYSTEMS, REPRINTS.IDENTIFIERS: (U) Hypersurfaces, Polyhedral partition  
functions, WUAFOSR2304A1, PE81102F.SUPPLEMENTARY NOTE: Pub. in International Jnl. of Mass  
Spectrometry and Ion Processes, v80 p51-62 1987.

ABSTRACT: (U) Vibrational overlap integrals have been calculated for the transition between the neutral ground state and the ion state of Ammonia and ND<sub>3</sub> for the vibrational bending mode. Calculations were performed by numerically solving the Schroedinger equation. The vibrational overlap integrals were used to simulate the dependence of the cross-section for the symmetric charge-transfer reaction on the initial vibrational quantum state of the ion. The cross-sections show a gradual increase with the vibrational bending mode in agreement with experiment.

DESCRIPTORS: (U) \*AMMONIA, \*CHARGE TRANSFER, \*OVERLAP,  
\*MOLECULAR VIBRATION, \*CATIONS, BENDING, GROUND STATE,  
INTEGRALS, IONS, NEUTRAL, QUANTUM THEORY, SCHRODINGER  
EQUATION, SYMMETRY, QUANTUM CHEMISTRY, ELECTRONIC STATES,  
MOLECULAR ENERGY LEVELS.IDENTIFIERS: (U) \*Ion molecule interactions,  
WUAFOSR2303B1, PE81102F.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

(U) Exchange Reactions between Trimethylsilyl Azide and Hexamethyldigermoxane,

88 5P

PERSONAL AUTHORS: Zhou, Qingshan; Weber, William P.

CONTRACT NO. AFOSR-88-0042

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-88-0574

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organometallic Chemistry, v342 p291-294 1988.

ABSTRACT: (U) Trimethylsilyl azide and hexamethyldigermoxane undergo exchange at room temperature to stoichiometrically yield trimethyl(trimethylsiloxy)germane and trimethylgermyl azide. The rates of this second order reaction have been measured at several temperatures between 21 and 53 C. The large negative entropy of activation implies a highly ordered transition state for this reaction.

DESCRIPTORS: (U) \*EXCHANGE REACTIONS, \*AZIDES, \*GERMANIUM COMPOUNDS, \*HYDRIDES, \*OXYGEN COMPOUNDS, ENTROPY, METHYL RADICALS, SILICON, HEAT OF ACTIVATION, REPRINTS, ROOM TEMPERATURE.

IDENTIFIERS: (U) Azide/trimethylsilyl, Germoxane(d1)/hexamethyl, Germane/trimethyl(trimethylsiloxy), Azide/trimethylgermyl, WUAFOSR2303B2, PE61102F.

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BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) ART (Adaptive Resonance Theory) 2: Self-Organization of Stable Category Recognition Codes for Analog Input Patterns,

DEC 87 15P

PERSONAL AUTHORS: Carpenter, Gail A.; Grossberg, Stephen

CONTRACT NO. F49620-88-C-0037, F49620-87-C-0018

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-88-0492

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Applied Optics, v26 n23 p4819-4930, 1 Dec 87.

ABSTRACT: (U) Adaptive resonance architectures are neural networks that self-organize stable pattern recognition codes in real-time in response to arbitrary sequences of input patterns. This article introduces ART 2, a class of adaptive resonance architectures which rapidly self-organize pattern recognition categories in response to arbitrary sequences of either analog or binary input patterns.

DESCRIPTORS: (U) \*NEURAL NETS, \*PATTERN RECOGNITION, \*COMPUTER ARCHITECTURE, ADAPTIVE SYSTEMS, ANALOG SYSTEMS, CODING, INPUT, PATTERNS, RECOGNITION, RESONANCE, SEQUENCES, THEORY, TRADE OFF ANALYSIS.

IDENTIFIERS: (U) PE61152F, WUAFOSR2304A7.

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TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER APPLICATIONS

(U) Laser Thermal Propulsion Using Laser Sustained Plasmas,

87 11P

PERSONAL AUTHORS: Keefer, D.; Jeng, San-Mou; Welle, R.

CONTRACT NO. AFOSR-86-0317

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0571

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Acta Astronautica, v15 n8-7  
p367-378 1987.

ABSTRACT: (U) Laser thermal propulsion refers to a concept in which power from a laser is beamed to a vehicle, where it is absorbed and used to heat a propellant gas that produces thrust at high values of specific impulse. The success of the concept depends upon the ability to create laser sustained plasmas that are stable in the presence of a forced convection flow and that absorb essentially all of the incident laser radiation. In addition, the thermal radiation losses from the plasma must be controlled to realize high performance without the penalty of thermal radiators. Extensive experiments have been performed and analyzed utilizing plasmas sustained in flowing argon by a carbon dioxide laser of less than 1 kW incident power. Spatially detailed measurements of the temperature in the plasmas have resulted in a detailed understanding of the energy conversion processes occurring within the plasma. This understanding has provided an explanation of the limited range of pressure and power observed for stable operation of laser sustained plasmas and suggests the means by which that range can be extended. A computational model based on a Navier-Stokes description of the flow has been developed which utilizes ray tracing for the optical interaction and temperature dependent experimental results of the argon plasmas and has been extended to

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provide predictions for higher laser powers in hydrogen.

DESCRIPTORS: (U) \*PLASMA ENGINES, \*LASER PUMPING, ARGON, CARBON DIOXIDE LASERS, COMPUTATIONS, CONVECTION, ENERGY CONVERSION, GASES, HYDROGEN, INTERACTIONS, LASER BEAMS, LOSSES, MATHEMATICAL MODELS, NAVIER STOKES EQUATIONS, OPTICAL PROPERTIES, PLASMAS(PHYSICS), PRESSURE, PROPELLANTS, RADIATORS(GENERAL), RAY TRACING, REPRINTS, SPECIFIC IMPULSE, THERMAL PROPERTIES, THERMAL PROPULSION SYSTEMS, THERMAL RADIATION, RADIATION PRESSURE, THERMAL PROPERTIES, BREMSSTRAHLUNG.

IDENTIFIERS: (U) \*Laser produced plasmas, Inverse bremsstrahlung, PE61102F, WJAFOSR2308A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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ELECTROMAGNETIC INTERFERENCE, NOISE(ELECTRICAL AND ELECTROMAGNETIC), BIOMEDICINE.

(U) SQUID (Superconducting Quantum Interference Device) Arrays for Simultaneous Magnetic Measurements: Calibration and Source Localization Performance.

IDENTIFIERS: (U) SQUID(Superconducting Quantum Interference Devices). WUAFOSR3484A4, PES1103D.

DESCRIPTIVE NOTE: Rept. for Sep 88-Feb 88.

FEB 88 28P

PERSONAL AUTHORS: Kaufman, Lloyd; Williamson, Samuel J.; Costa Ribeiro, P.

CONTRACT NO. F49620-88-C-0131, F49620-85-K-0004

PROJECT NO. 3484

TASK NO. A4

MONITOR: AFOSR  
YR-88-0384

UNCLASSIFIED REPORT

ABSTRACT: (U) Recently developed small arrays of SQUID-based magnetic sensors can, if appropriately placed, locate the position of a confined biomagnetic source without moving the array. The authors present a technique with a relative accuracy of about 2% for calibrating such sensors having detection coils with the geometry of a second-order gradiometer. The effects of calibration error and magnetic noise on the accuracy of locating an equivalent current dipole source in the human brain are investigated for 5- and 7-sensor probes and for a pair of 7-sensor probes. With a noise level of 5% of peak signal, uncertainties of about 20% in source strength and depth for a 5-sensor probe are reduced to 8% for a pair of 7-sensor probes, and uncertainties of about 15 mm in lateral position are reduced to 1 mm, for the configuration considered.

DESCRIPTORS: (U) \*BIOMAGNETISM, \*MAGNETIC DETECTORS, ACCURACY, ARRAYS, BRAIN, CALIBRATION, COILS, CONFINEMENT(GENERAL), DETECTION, DETECTORS, DIPOLES, ERRORS, HUMANS, INTERFERENCE, LEVEL(QUANTITY), MAGNETIC FIELDS, MAGNETIC PROPERTIES, MEASUREMENT, PEAK VALUES, QUANTUM THEORY, SIGNALS, SOURCES, STRENGTH(GENERAL), SUPERCONDUCTIVITY, SYNCHRONISM, QUANTUM ELECTRONICS.

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NEW YORK UNIV N Y

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ELECTROMAGNETIC INTERFERENCE, NOISE(ELECTRICAL AND  
ELECTROMAGNETIC), BIOMEDICINE.

(U) SQUID (Superconducting Quantum Interference Device)  
Arrays for Simultaneous Magnetic Measurements:  
Calibration and Source Localization Performance.

IDENTIFIERS: (U) SQUID(Superconducting Quantum  
Interference Devices), WUAFOSR3484A4, PE61103D.

DESCRIPTIVE NOTE: Rept. for Sep 86-Feb 88.

FEB 88 28P

PERSONAL AUTHORS: Kaufman, Lloyd; Williamson, Samuel J.;  
Costa Ribeiro, P.

CONTRACT NO. F49620-88-C-0131, F49620-85-K-0004

PROJECT NO. 3484

TASK NO. A4

MONITOR: AFOSR  
YR-88-0364

UNCLASSIFIED REPORT

ABSTRACT: (U) Recently developed small arrays of SQUID-based magnetic sensors can, if appropriately placed, locate the position of a confined biomagnetic source without moving the array. The authors present a technique with a relative accuracy of about 2% for calibrating such sensors having detection coils with the geometry of a second-order gradiometer. The effects of calibration error and magnetic noise on the accuracy of locating an equivalent current dipole source in the human brain are investigated for 5- and 7-sensor probes and for a pair of 7-sensor probes. With a noise level of 5% of peak signal, uncertainties of about 20% in source strength and depth for a 5-sensor probe are reduced to 8% for a pair of 7-sensor probes, and uncertainties of about 15 mm in lateral position are reduced to 1 mm, for the configuration considered.

DESCRIPTORS: (U) \*BIOMAGNETISM, \*MAGNETIC DETECTORS, ACCURACY, ARRAYS, BRAIN, CALIBRATION, COILS, CONFINEMENT(GENERAL), DETECTION, DETECTORS, DIPOLES, ERRORS, HUMANS, INTERFERENCE, LEVEL(QUANTITY), MAGNETIC FIELDS, MAGNETIC PROPERTIES, MEASUREMENT, PEAK VALUES, QUANTUM THEORY, SIGNALS, SOURCES, STRENGTH(GENERAL), SUPERCONDUCTIVITY, SYNCHRONISM, QUANTUM ELECTRONICS,

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NEW YORK UNIV N Y

TENNESSEE UNIV SPACE INST TULLAHOMA

(U) Methods and Instrumentation for Biomagnetism.

(U) Power Absorption in Laser-Sustained Argon Plasmas.

DESCRIPTIVE NOTE: Rept. for 1 Jan 87-28 Feb 88.

OCT 86 9P

FEB 88 9P

PERSONAL AUTHORS: Kaufman, Lloyd; Williamson, Samuel J.; Robinson, S. E.

CONTRACT NO. F49820-85-K-0004, SCHE-HER/86-14

PROJECT NO. 2313

PROJECT NO. 2308

TASK NO. A4

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR  
TR-88-0570

TR-88-0344

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Capabilities for biomagnetic measurements have been advanced by the successful development of a Superconducting Quantum Interference Device (SQUID)-based magnetic sensor that does not rely on liquid helium for cooling. This system, known as CryoSQUID, achieves a sensor noise level that is appropriate for high-sensitivity measurements of the magnetic field of the human brain. It employs an external compressor and a two-stage refrigerator within the sensor's dewar to cool a dc SQUID and associated detection coil. The sensor can be operated in any orientation, including horizontally and up-side down. Keywords: Magnetoencephalograms; Cardiology.

DESCRIPTORS: (U) \*BIOMAGNETISM, \*MAGNETOENCEPHALOGRAMS, \*MAGNETIC DETECTORS, BRAIN, CARDIOGRAPHY, COILS, COMPRESSORS, COOLING, DETECTION, DETECTORS, EXTERNAL, HIGH SENSITIVITY, HUMANS, LEVEL (QUANTITY), LIQUID HELIUM, MAGNETIC FIELDS, MEASUREMENT, NOISE, REFRIGERATION SYSTEMS, STAGING, MEASURING INSTRUMENTS.

IDENTIFIERS: (U) SQUID(Superconducting Quantum Interference Device), WUAFOSR2313A4, PE61102F.

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SUPPLEMENTARY NOTE: Pub. in AIAA Journal, v24 n10 p1883-1889 Oct 86.

ABSTRACT: (U) In this experimental investigation, stable and axisymmetric laser sustained plasmas were produced in flowing argon. Energy was provided by the focused beam from a carbon dioxide laser; two different focusing geometries were used. Spatial distributions of absolute radiance from the plasmas, in a narrow-wavelength band, were measured. The assumption of axial symmetry, along with the assumption of local thermodynamic equilibrium, was used to deduce the radial profiles of temperature in the plasmas. From this and a geometric raytrace, the detailed spatial distribution of power absorption was calculated, as well as the radiation lost from the plasmas. In addition to the focusing geometry, the flow velocity, pressure, and incident laser power were systematically varied in the experiments. The quantitative results indicate clearly that a perceptive analysis of such laser-sustained plasmas must take into consideration the two dimensionality of both the flowfield and the laser energy distribution in the focused beam. Keywords: Axisymmetric, Spatial, Thermodynamic raytrace, Reprints.

DESCRIPTORS: (U) \*LASER PUMPING, \*PLASMAS(PHYSICS), AXISYMMETRIC, CARBON DIOXIDE LASERS, ENERGY, EQUILIBRIUM(GENERAL), FLOW FIELDS, FLOW RATE, FOCUSING, GEOMETRY, POWER, PROFILES, RADIAL FLOW, RADIANCE, RAY

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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TRACING, REPRINTS, SPATIAL DISTRIBUTION, TEMPERATURE,  
THERMODYNAMICS, VELOCITY, ARGON, RADIATION ABSORPTION.

TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER  
APPLICATIONS

IDENTIFIERS: (U) \*Laser produced plasmas, WJAFOSR2308A1,  
PE61102F.

(U) Abel Inversion Using Transform Techniques.

DESCRIPTIVE NOTE: Rept. for 1 Sep 86-31 Aug 87.

APR 88 9P

PERSONAL AUTHORS: Keefer, Dennis R.; Smith, L. M.;  
Sudharsanan, S. I.

CONTRACT NO. AFOSR-86-0317

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0538

UNCLASSIFIED REPORT

ABSTRACT: (U) A method is presented for calculating the reconstruction of a circularly symmetric two-dimensional function from its projection, a relation known as the Abel inversion. This technique differs from techniques used previously by using integral transforms for its implementation. The frequency domain analysis allows for experimentally obtained data, which is often noisy and off center, to be dealt with in a systematic, rational manner. The formulation of the Abel inversion in terms of transforms, the filtering of the noise, and the estimate of the off-center shift are discussed. Sample calculations of simulated noisy data and the application of the method to an image of a laser sustained plasma are presented.

DESCRIPTORS: (U) \*INTEGRAL TRANSFORMS, \*MATHEMATICAL FILTERS, \*OPTICAL ANALYSIS, CIRCULAR, FUNCTIONS, LASERS, NOISE, PLASMAS(PHYSICS), SYMMETRY, TWO DIMENSIONAL, NOISE REDUCTION, DIAGNOSIS(GENERAL).

IDENTIFIERS: (U) Abel inversions, Frequency domain, Laser produced plasmas, PE61102F, WJAFOSR2308A1.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A193 780 12/2

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) A Unified Framework for Approximation in Inverse Problems for Distributed Parameter Systems.

OCT 87 32P

PERSONAL AUTHORS: Banks, H. Y.; Ito, K.

REPORT NO. LCDS/CCS-87-62.

CONTRACT NO. F49620-88-C-0011

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0392

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The authors present a theoretical framework that can be used to treat approximation techniques for very general classes of parameter estimation problems involving distributed systems that are either first or second order in time. Using the approach developed, one can obtain both convergence and stability (continuous dependence of parameter estimates with respect to the observations) under very weak regularity and compactness assumptions on the set of admissible parameters. This unified theory can be used for many problems found in the recent literature and in many cases offers significant improvements to existing results. Keywords: Partial differential equations.

**DESCRIPTORS:** (U) \*PARAMETRIC ANALYSIS, \*APPROXIMATION(MATHEMATICS), ESTIMATES, INVERSION, PARAMETERS, PARTIAL DIFFERENTIAL EQUATIONS, APPLIED MATHEMATICS, CONVERGENCE, STABILITY.

**IDENTIFIERS:** (U) WJAFOSR2304A1, PE81102F.

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AD-A193 775 12/1

NORTH CAROLINA STATE UNIV AT RALEIGH

(U) Control Problem Structure and the Numerical Solution of Linear Singular Systems.

88 18P

PERSONAL AUTHORS: Campbell, Stephen L.

CONTRACT NO. AFOSR-87-0051

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0102

UNCLASSIFIED REPORT

**SUPPLEMENTARY NOTE:** Pub. in Math. Control Signals Systems, v1 p73-87 1988.

**ABSTRACT:** (U) Recently, a general numerical procedure has been developed for solvable systems of singular differential equations  $\dot{E}(t)x'(t) + f(t)$ . This paper shows not to exploit the structure present in many control problems to reduce the computational effort substantially. An example is worked which shows that additional reductions are possible in some cases.

**DESCRIPTORS:** (U) \*NUMERICAL METHODS AND PROCEDURES, \*DIFFERENTIAL EQUATIONS, CONTROL, CONTROL SYSTEMS, LINEAR SYSTEMS, NUMERICAL ANALYSIS, REPRINTS, SOLUTIONS(GENERAL), PROBLEM SOLVING, COMPUTATIONS.

**IDENTIFIERS:** (U) PE81102F, WJAFOSR2304A1.



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV146A

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TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER APPLICATIONS

ANALYSIS, PERFORMANCE(ENGINEERING), PHYSICAL PROPERTIES, POWER, PRESSURE, RAY TRACING, REGIONS, ROCKETS, SUBSONIC FLOW, SUPERSONIC FLOW, THEORY, THROAT, HYDROGEN, RADIATION ABSORPTION.

(U) A Theoretical Investigation of Laser-Sustained Plasma Thruster.

IDENTIFIERS: (U) Laser produced plasmas, PE61102F, WUAFOSR2308A1.

DESCRIPTIVE NOTE: Rept. for 1 Sep 88-31 Aug 87,

APR 88 13P

PERSONAL AUTHORS: Jeng, San-Mou; Keefer, Dennis

CONTRACT NO. AFOSR-88-0317

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0537

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at AIAA Aerospace Sciences Meeting (29th), 12-18 Jan 87, Reno, NV.

ABSTRACT: (U) A numerical code has been successfully developed for the investigation of thruster performance using a laser-sustained hydrogen plasma as the propellant. The plasma was sustained using a 10.6 micrometer CO<sub>2</sub> laser beam which is focused at different positions within the thruster. The physical model assumed that plasma is in thermodynamically equilibrium (LTE), and geometric ray tracing was adopted to describe the laser beam. The steady-state, axisymmetric, Navier-Stokes equations coupled with the laser power absorption process have been solved numerically. A pressure based Navier-Stokes numerical solver using body-fitted coordinates was used to calculate the laser-supported rocket flow which includes both subsonic and supersonic flow regions. From the limited parametric study, which did not try to optimize the rocket performance, it was found that better performance was obtained when the laser beam was focused closer to the rocket throat.

DESCRIPTORS: (U) \*THRUSTERS, \*PLASMA ENGINES, \*LASER PUMPING, CODING, GEOMETRY, LASER BEAMS, LASERS, MODELS, NAVIER STOKES EQUATIONS, NUMERICAL ANALYSIS, PARAMETRIC

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A193 764 CONTINUED

AD-A193 764 21/2 20/3 14/2  
TENNESSEE UNIV SPACE INST TULLAHOMA CENTER FOR LASER APPLICATIONS

(U) A Theoretical Evaluation of Laser Sustained Plasma Thruster Performance.

DESCRIPTIVE NOTE: Rept. for 1 Sep 86-31 Aug 87.

APR 88 10P

PERSONAL AUTHORS: Jeng, San-Mou; Keefer, Dennis

CONTRACT NO. AFOSR-86-0317

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0539

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at AIAA/SAE/ASME/ASCE Joint Propulsion Conference (23rd), San Diego, CA, 29 Jun-2 Jul 87.

ABSTRACT: (U) An extensive numerical experiment has been conducted to evaluate rocket thruster performance using a laser-sustained hydrogen plasma as the propellant. The plasma was sustained using a 30 kW CO<sub>2</sub> laser beam operated at 10.6 micrometers focused inside the thruster. The steady-state Navier-Stokes equations coupled with the laser power absorption process have been solved numerically. A pressure based Navier-Stokes solver using body-fitted coordinate was used to calculate the laser-supported rocket flow which included both recirculating and transonic flow regions. The local thermodynamic equilibrium (LTE) assumption was used for the plasma thermophysical and optical properties. Geometric ray tracing was adopted to describe the laser beam. Several different throat size thrusters operated at 150 and 300 kPa chamber stagnation pressure were studied. It was found that the thruster performance (vacuum specific impulse) was highly dependent on the operating conditions, and a properly designed laser supported thruster can attain a specific impulse around 1500 secs. The heat loading on the thruster wall was also estimated and was

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In the range of that for a conventional chemical rocket.  
Keywords: Steady state; Navier Stokes; Laser sustained; Transonic; Body fitted coordinates; Recirculating; Equilibrium.

DESCRIPTORS: (U) \*NAVIER STOKES EQUATIONS, \*THRUSTERS, \*PLASMA ENGINES, \*COMBUSTION CHAMBERS, \*COMBUSTION CHAMBER GASES, CHEMICALS, EQUILIBRIUM(GENERAL), FLOW, GEOMETRY, HEAT, LASER BEAMS, NUMERICAL ANALYSIS, OPTICAL PROPERTIES, PERFORMANCE(ENGINEERING), PLASMAS(PHYSICS), PRESSURE, RAY TRACING, RECIRCULATION, SPECIFIC IMPULSE, STAGNATION PRESSURE, STEADY STATE, TEST AND EVALUATION, THERMODYNAMICS, THERMOPHYSICAL PROPERTIES, TRANSONIC FLOW, VACUUM, WALLS, DIGITAL SIMULATION, CARBON DIOXIDE LASERS, RADIATION ABSORPTION, ROCKET ENGINES.

IDENTIFIERS: (U) PEG110ZF, WUAFOSR2308A1.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

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AD-A193 714 12/4

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

WASHINGTON STATE UNIV PULLMAN DEPT OF PURE AND APPLIED MATHEMATICS

(U) Boundary Shape Identification Problems in Two-Dimensional Domains Related to Thermal Testing of Materials.

(U) An Implementation of an Algorithm for Univariate Minimization and an Application to Nested Optimization.

DESCRIPTIVE NOTE: Journal article.

APR 88 35P

87 13P

PERSONAL AUTHORS: Banks, H. T.; Kojima, Fumio

PERSONAL AUTHORS: Mifflin, Robert

REPORT NO. LCDS/CCS-88-8

CONTRACT NO. AFOSR-83-0210

CONTRACT NO. F49620-88-C-0110

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A8

MONITOR: AFOSR

MONITOR: AFOSR

TR-88-0584

TR-88-0334

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This paper is concerned with the identification of the geometrical structure of the system boundary for a two-dimensional diffusion system. The domain identification problem treated here is converted into an optimization problem based on a fit-to-data criterion and theoretical convergence results for approximate identification techniques are discussed. Results of numerical experiments to demonstrate the efficacy of the theoretical ideas are reported.

SUPPLEMENTARY NOTE: Pub. in Mathematical Programming Study, v31 p155-166 1987.

ABSTRACT: (U) This paper gives an implementation of the author's theoretical algorithm for solving single variable constrained minimization problems. The method can deal with certain nonsmooth problem functions in a rapidly convergent and numerically reliable manner. Also provided is the corresponding FORTRAN subroutine PQ1 and a description of its use in a nested manner to solve a practical resource allocation problem given in Heiner, Kupferschmid and Ecker. In Section 2, the problems defined and some general applications are discussed briefly. The computational version of the algorithm is described in Section 3. This discussion gives some details about extrapolation, numerical safeguarding, user-defined parameters and possible tests. Also given is an explanation about how to use the subroutine PQ1. Section 4 describes the efficient solution of a single resource allocation problem with five bounded decision variables. A dual approach is used in order to take advantage of separability in the objective and constraint functions. This application used PQ1 in a nested manner, i.e., a single variable dual (outer) problem is solved where each function evaluation involves solving a five variable

DESCRIPTORS: (U) \*THERMAL DIFFUSION, \*SYSTEMS ANALYSIS, \*NONDESTRUCTIVE TESTING, BOUNDARIES, BOUNDARY VALUE PROBLEMS, CONVERGENCE, GEOMETRY, IDENTIFICATION, MATERIALS, NUMERICAL METHODS AND PROCEDURES, OPTIMIZATION, SHAPE, TEST AND EVALUATION, TWO DIMENSIONAL, APPLIED MATHEMATICS, HILBERT SPACE, FINITE ELEMENT ANALYSIS, AIR FORCE RESEARCH.

IDENTIFIERS: (U) PEG1102F, WJAFOSR2304A1.

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Lagrangian (inner) problem that separates into five independent single variable problems. The appendix consists of a listing of Pq1. The listing contains comments describing this subroutine's arguments.

DESCRIPTORS: (U) \*MATHEMATICAL PROGRAMMING, \*SUBROUTINES, ALGORITHMS, ALLOCATIONS, DECISION MAKING, EFFICIENCY, OPTIMIZATION, REPRINTS, RESOURCE MANAGEMENT, SOLUTIONS(GENERAL), VARIABLES, OPTIMIZATION, FORTRAN, PROBLEM SOLVING, REPRINTS.

IDENTIFIERS: (U) Univariate analysis, WJAFOSR2304A8, PE81102F.

FLORIDA UNIV GAINESVILLE DEPT OF CHEMISTRY

(U) Laser-Induced Double Resonance Ionic Fluorescence of Rare Earths in the Inductively Coupled Plasma.

88 7P

PERSONAL AUTHORS: Tremblay, W. E.; Simonsson, J. B.; Smith, B. W.; Winefordner, J. D.

CONTRACT NO. AFOSR-86-0015

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-88-0557

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. In Applied Spectroscopy, v42 n2 p281-285 1988.

ABSTRACT: (U) Laser Excitation of ionic fluorescence overcomes the problem of spectral interferences encountered when trace analysis of the rare earths is performed by atomic/ionic emission spectrometry in the inductively coupled plasma. Two pulsed, excimer pumped, tunable dye lasers are used to excite ionic fluorescence of rare earths in an inductively coupled plasma. Since several fluorescence lines have been observed after laser excitation, it is possible to draw partial energy level diagrams for lanthanum, ytterbium, europium, and lutetium. Keywords: Laser excitation, Double resonance, Rare earths, Optical Saturation.

DESCRIPTORS: (U) \*PLASMAS(PHYSICS), \*RARE EARTH COMPOUNDS, \*RESONANCE, \*LASER PUMPING, \*LASER INDUCED FLUORESCENCE, COUPLING(INTERACTION), DIAGRAMS, DYE LASERS, ENERGY LEVELS, EUROPIUM, EXCIMER, EXCITATION, LANTHANUM, LASERS, LUTETIUM, OPTICAL PROPERTIES, SATURATION, TRACER STUDIES, TUNABLE LASERS, YTTERBIUM.

IDENTIFIERS: (U) ICP(Inductively Coupled Plasmas), WJAFOSR2303A1, PE81102F.

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SEARCH CONTROL NO. EVI48A

AD-A193 873 12/8 12/9

AD-A193 671 12/6 12/5

OHIO STATE UNIV COLUMBUS

MOREHOUSE COLL ATLANTA GA

(U) Parallel Real-Time Expert Systems.

(U) Recoding GCSNAST for the VAX 11/780.

DESCRIPTIVE NOTE: Final rept. 11 Nov 88-30 Apr 88.

DESCRIPTIVE NOTE: Final rept. 25 Jan 85-9 Mar 88.

FEB 88 5P

MAR 88 4P

PERSONAL AUTHORS: Chandrasekaran, B.; Schwan, Karsten

PERSONAL AUTHORS: Jones, Arthur M.

CONTRACT NO. AFOSR-87-0076

CONTRACT NO. AFOSR-85-0140

PROJECT NO. 2304

PROJECT NO. 2917

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR  
TR-88-0358

MONITOR: AFOSR  
TR-88-0559

UNCLASSIFIED REPORT

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ABSTRACT: (U) This report summarizes work done under a grant issued through the University Research Instrumentation Program. The grant was issued to support the purchase of parallel processing equipment to conduct experimental research in high-speed real-time decision making by parallelism. The facilities were used to understand the software requirements of real-time systems, such as complex robotics systems. Keywords: Multiprocessors; CHAOS (Concurrent Hierarchical Adaptable Object System).

DESCRIPTORS: (U) \*ROBOTICS, \*PARALLEL PROCESSORS, COMPUTER PROGRAMS, DECISION MAKING, INSTRUMENTATION, MULTIPROCESSORS, PARALLEL ORIENTATION, PARALLEL PROCESSING, PROCESSING EQUIPMENT, REAL TIME, REQUIREMENTS, RESEARCH MANAGEMENT.

IDENTIFIERS: (U) Expert systems, CHAOS(Concurrent Hierarchical Adaptable Object System), PES1102F, WUAFOSR2304A5.

ABSTRACT: (U) The object of this project was to evaluate the effectiveness of a computer programming setting in which a wide variety of computer hardware exist. Such a setting, of course, is in no way unusual, to the contrary, it may in fact represent the norm. But because the criteria used generally to select hardware include a host of factors other than machine performance, environments such as that described above will continue to exist as long as there remains a variety of hardware in the marketplace. This project was intended as an experiment in making the most of that variety within the context of an organization which engages in research/production activities. Project activities were conducted on a minicomputer (DEC VAX 11/780) and a variety of microcomputers. Equipment was selected and environments were structured to resolve the following issues: 1) whether the acquisition of a software-specific microcomputer rather than a general-purpose one can be cost-effective; 2) whether a network of microcomputers can provide a program production environment alternative to the minicomputer; 3) whether a useful alternative microcomputer programming environment can be embedded within a minicomputer; and 4) whether microcomputers on the low end of the price range could provide an adequate programming environment.

DESCRIPTORS. (U) \*COMPUTER PROGRAMMING, \*MICROCOMPUTERS,

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\*MINICOMPUTERS, ACQUISITION, COMPUTERS, COSTS,  
ENVIRONMENTS, NETWORKS, PRODUCTION, SETTING(ADJUSTING).

JOHNS HOPKINS UNIV BALTIMORE MD DEPT OF ELECTRICAL  
ENGINEERING AND COMPUTER SCIENCE

IDENTIFIERS: (U) PE81102F, WUAFOSR2917A5.

(U) Linearized Model Matching for Single-Input Nonlinear  
Systems.

DESCRIPTIVE NOTE: Technical rept. 1 Mar 87-29 Feb 88,

MAR 88 13P

PERSONAL AUTHORS: Rugh, Wilson J.

CONTRACT NO. AFOSR-87-0101

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-88-0437

UNCLASSIFIED REPORT

ABSTRACT: (U) In recent years there has been rapid development of the closely-related pseudo-linearization and extended linearization approaches for design of nonlinear control laws for nonlinear systems. This paper adopts a frequency-domain viewpoint, and use results in an earlier document to formulate and solve a linearized model matching problem for single-input, multi-output nonlinear systems. The objective is to construct a nonlinear, dynamic, output feedback control law so that the resulting closed-loop system, when linearized about its family of constant operating points, has a linearization family with transfer function that matches exactly a given parameterized transfer function. If the given transfer function is parameter independent, then this problem can be viewed as a type of input-output pseudo-linearization problem.

DESCRIPTORS: (U) \*NONLINEAR SYSTEMS, \*INPUT OUTPUT MODELS, CLOSED LOOP SYSTEMS, CONTROL THEORY, FEEDBACK, LINEARITY, MATCHING, LINEAR SYSTEMS, OUTPUT, TRANSFER FUNCTIONS.

IDENTIFIERS: (U) Single input multi output nonlinear systems, PE81102F, WUAFOSR2304A1.

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SEARCH CONTROL NO. EVI48A

AD-A193 840 8/4 12/4

AD-A193 639 12/2

NEW YORK UNIV N Y

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Visual Motion Perception and Visual Attentive Processes.

(U) An Approximation Theory for the Identification of Nonlinear Distributed Parameter Systems.

DESCRIPTIVE NOTE: Final rept. 30 Sep 85-30 Nov 87.

APR 88 18P

APR 88 42P

PERSONAL AUTHORS: Sperling, George

PERSONAL AUTHORS: Banks, H. T.; Reich, Simeon; Rosen, I. G.

CONTRACT NO. AFOSR-85-0384

REPORT NO. LCDS/CCS-88-8

PROJECT NO. 2313

CONTRACT NO. AFOSR-84-0383, AFOSR-87-0358

TASK NO. A5

PROJECT NO. 2304

MONITOR: AFOSR TR88-0551

TASK NO. A1

MONITOR: AFOSR TR-88-0585

UNCLASSIFIED REPORT

ABSTRACT: (U) The motion projects described in this report include the specification of low level motion detection systems which are both Fourier and NonFourier in kind, investigations in visual persistence in motion, higher level issues in structure from motion, cue integration and decision theory, and object recognition. The attention projects concern the human ability to process information arriving simultaneously at different locations in the visual field and to coordinate concurrent visual and auditory inputs. A common goal of projects was the attention description of the human abilities and limitations in the allocation of mental processing resources, and correspondingly, the theoretical derivation of visual and auditory stimulus codes that take optimum advantage of human abilities.

DESCRIPTORS: (U) \*ATTENTION, \*VISUAL PERCEPTION, \*SPACE PERCEPTION, \*MATHEMATICAL MODELS, CODING, DECISION THEORY, HEARING, HUMANS, MENTAL ABILITY, MOTION, RECOGNITION, SKILLS, STIMULI, VISION, FOURIER TRANSFORMATION, IMAGE PROCESSING, ALGORITHMS.

IDENTIFIERS: (U) \*Motion perception, PE81102F, WJAFOSR2313A5.

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ABSTRACT: (U) An abstract approximation framework for the identification of nonlinear distributed parameter systems is developed. Inverse problems for nonlinear systems governed by strongly maximal monotone operators (satisfying a mild continuous dependence condition with respect to the unknown parameters to be identified) are treated. Convergence of Galerkin approximations and the corresponding solutions of finite dimensional approximating identification problems to a solution of the original infinite dimensional identification problem is demonstrated using the theory of nonlinear evolution systems and a nonlinear analog of the Trotter-Kato approximation result for semigroups of bounded linear operators. The nonlinear theory developed here is shown to subsume an existing linear theory as a special case. It is also shown to be applicable to a broad class of nonlinear elliptic operators and the corresponding nonlinear parabolic partial differential equations to which they lead. An application of the theory to a quasilinear model for heat conduction or mass transfer is discussed.

DESCRIPTORS: (U) \*APPROXIMATION(MATHEMATICS), \*NONLINEAR SYSTEMS, ANALOG SYSTEMS, DISTRIBUTION, EVOLUTION(GENERAL).

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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AD-A193 622 9/1

IDENTIFICATION, INVERSION, LINEAR SYSTEMS, LINEARITY,  
MASS TRANSFER, OPERATORS(MATHEMATICS), PARAMETERS,  
PROBLEM SOLVING, THEORY, THERMAL CONDUCTIVITY, APPLIED  
MATHEMATICS, MATHEMATICAL MODELS, NONLINEAR DIFFERENTIAL  
EQUATIONS, PARTIAL DIFFERENTIAL EQUATIONS.

MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF  
ELECTRONICS

(U) Custom Integrated Circuits.

DESCRIPTIVE NOTE: Rept. for Jan-Dec 88.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1.

JAN 87 8P

PERSONAL AUTHORS: Allen, Jonathan; Glasser, Lance A.;  
Musicus, Bruce R.; Penfield, P., Jr.; Wyatt, J. L., Jr

CONTRACT NO. AFOSR-88-0154

PROJECT NO. 2305

TASK NO. 84

MONITOR: AFOSR  
TR-88-0079

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in RLE Progress Report, n129 p77-  
82 Jan 87.

ABSTRACT: (U) The research goal of this project is to  
devise CAD techniques for the performance directed  
synthesis of digital VLSI circuits, focused on digital  
signal processing applications. The main goal is to  
develop expert system techniques that are designed to  
yield optimal performance in these signal processing  
systems through a fundamental approach to the design task.  
An overall design involves the specification of multiple  
constraint domains corresponding to various levels of  
representation. These facets include the function,  
architecture, logic, circuit, layout, and device levels.  
They must be coherently related so that each is a  
consistent and correct projection of the complete design  
onto a single facet or type of representation.

DESCRIPTORS: (U) \*DIGITAL SYSTEMS, \*INTEGRATED CIRCUITS,  
\*SIGNAL PROCESSING, REPRINTS, YIELD.

IDENTIFIERS: (U) PE81102F, WUAFOSR2305B4.

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OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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AD-A193 615 12/3

MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) Infrared Nonlinear Optics.

(U) Strong Law for Mixing Sequence.

DESCRIPTIVE NOTE: Rept. for Jan-Dec 86.

DESCRIPTIVE NOTE: Technical rept.,

JAN 87 6P

DEC 87 15P

PERSONAL AUTHORS: Wolff, Peter A.; Aggarwal, Roshan L.; Secia, Piotr; Ram-Mohan, L. R.; Yuen, Sunny Y.

PERSONAL AUTHORS: Chen, Xiru; Wu, Yuehua

CONTRACT NO. AFOSR-85-0269

CONTRACT NO. F49620-85-C-0008

PROJECT NO. 2305

PROJECT NO. 2304

TASK NO. 81

TASK NO. A6

MONITOR: AFOSR TR-88-0080

MONITOR: AFOSR TR-88-0401

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in RLE Progress Report, n129 p51-54 Jan 87.

ABSTRACT: (U) This document presents some theorems on the strong law for the mixing sequence which is not necessarily stationary, and the mixing coefficient involving only a pair of variables in the sequence. Keywords: Large numbers, Random variables, Autoregression models.

ABSTRACT: (U) Infrared nonlinear optics; Nonlinear optics in mercury telluride; Nonlinear current voltage characteristics in mercury manganese telluride; Free carrier spin-induced faraday rotation in HgCdTe and HgMnTe; Optical nonlinearity caused by resonant scattering; and stress tuned, magnetic-field-induced anticrossing in arsenic-doped germanium.

DESCRIPTORS: (U) \*INFRARED OPTICAL SYSTEMS, INFRARED OPTICAL SYSTEMS, MANGANESE, MERCURY COMPOUNDS, NONLINEAR SYSTEMS, OPTICAL PROPERTIES, OPTICS, RESONANCE, SCATTERING, TELLURIDES, VOLTAGE, REPRINTS, LIGHT SCATTERING, CADMIUM TELLURIDES, GERMANIUM, DOPING, ARSENIC, MAGNETIC FIELDS, TUNING.

DESCRIPTORS: (U) \*COEFFICIENTS, \*MIXING, \*THEOREMS, RANDOM VARIABLES, SEQUENCES, VARIABLES, MULTIVARIATE ANALYSIS.

IDENTIFIERS: (U) Autoregression analysis, PE81102F, WUAFOSR2304A6.

IDENTIFIERS: (U) Nonlinear optics, Mercury tellurides, Mercury cadmium tellurides, Mercury manganese tellurides, Resonant scattering, PE81102F, WUAFOSR2305B1.

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AD-A193 598 7/6

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Current Status of Polyphosphazene Chemistry.

(U) A Liquid Crystalline Poly(organophosphazene).

88

87

3P

PERSONAL AUTHORS: Allcock, Harry R.

PERSONAL AUTHORS: Kim, Chulhee; Allcock, Harry R.

CONTRACT NO. AFOSR-84-0147, DAAG29-85-K-0111

CONTRACT NO. AFOSR-84-0147

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR, ARO  
TR-88-0086, 226 p., 11-CHMONITOR: AFOSR  
TR-88-0085

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Inorganic and Organometallic Polymers, ACS Symposium, V360 p250-287 1988.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Macromolecules, V20 p1726-1727 1987.

ABSTRACT: (U) Inorganic polymer chemistry is an area of research that links the classical fields of ceramics, metals, and organic polymers, and provides opportunities for the synthesis of new substances that combine the properties of all three. Polyphosphazenes are inorganic macromolecules that illustrate the possibilities available for a wide range of other inorganic systems. In this article, it will be demonstrated that, depending on the synthesis method and molecular structure, it is possible to bias the properties toward those of ceramics, metals, or organic high polymers, and also to provide polymers of biomedical interest. Keywords: Phosphazenes, Polyphosphazenes, Review, Inorganic polymers, Organometallic polymers, Molecular structure.

ABSTRACT: (U) This is the first polyphosphazene synthesized in our laboratory that shows definite thermotropic liquid crystalline character. A mesogenic aromatic azo unit is linked to the polymer chain through tri(ethylene oxide) spacer groups. Keywords: Polyphosphazenes, Liquid crystalline, Spacer groups, Poly(organophosphazene), Poly(dichlorophosphazene).

DESCRIPTORS: (U) \*LIQUID CRYSTALS, \*PHOSPHAZENE, \*POLYMERS, CHAINS, ORGANIC COMPOUNDS, REPRINTS, SPACERS.

IDENTIFIERS: (U) \*Polyphosphazene, PE61102F, WUAFOSR2303B2.

DESCRIPTORS: (U) \*ORGANOMETALLIC COMPOUNDS, \*PHOSPHAZENE, \*POLYMERS, CERAMIC MATERIALS, CHEMISTRY, INORGANIC CHEMISTRY, INORGANIC MATERIALS, INORGANIC POLYMERS, MACROMOLECULES, METALS, MOLECULAR STRUCTURE, ORGANIC COMPOUNDS, RANGE(EXTREMES), REPRINTS, SYNTHESIS(CHEMISTRY)

IDENTIFIERS: (U) \*Polyphosphazene, PE61102F, WUAFOSR2303B2.

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PENNSYLVANIA UNIV PHILADELPHIA DEPT OF MATERIALS SCIENCE  
AND ENGINEERING

method corrects serious shortcomings of the usually  
employed self consistent scheme.

(U) Analysis of Stiffness Reduction, Failure and Stress  
Concentration in Fiber Composite Laminates.

DESCRIPTORS: (U) \*FIBER REINFORCED COMPOSITES.  
\*LAMINATES, COMPOSITE MATERIALS, CONSISTENCY, CRACKS,  
DAMAGE, DENSITY, FAILURE, INTERNAL, ISOTROPISM, MATERIALS,  
POISSON RATIO, REDUCTION, STIFFNESS, STRESS CONCENTRATION,  
STRESSES, SURVEYS, TEMPERATURE, TEMPERATURE COEFFICIENTS,  
THERMAL EXPANSION, FAILURE(MECHANICS).

DESCRIPTIVE NOTE: Final rept. 1 Oct 85-31 Dec 87.

DEC 87 130P

PERSONAL AUTHORS: Hashin, Zvi

IDENTIFIERS: (U) PE81102F, WUAFOSR2302B2

CONTRACT NO. AFOSR-85-0342

PROJECT NO. 2302

TASK NO. B2

MONITOR: AFOSR  
TR-88-0387

UNCLASSIFIED REPORT

ABSTRACT: (U) A novel variational method to evaluate the stiffness reduction and the internal stresses in laminates has been developed and has been applied to analysis of glass/epoxy and graphite/epoxy laminates. The method has been extended to evaluate thermal expansion coefficients of cracked laminates and also internal stresses due to temperature change. Results demonstrate the stiffness, Poissons ratio and the thermal expansion coefficients changes with crack density. In particular, it has been shown that the values of thermal expansion coefficients of cracked laminates also depend on the signs of load and temperature change. Internal stresses obtained convey important information about sources of continued internal failure. A comprehensive survey on damage in fiber composite materials has been prepared including classification of the various kinds of damage and description of methods of analysis. The differential scheme approximation for effective properties of composite materials has been modified and generalized to the case of cracked materials. The method is of general nature. Specific results have been given for stiffness reduction due to cracks for isotropic materials containing many randomly oriented elliptical or penny shaped cracks and for orthotropic (fiber composite) sheets containing many aligned cracks (along fibers). The

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RANDOM APPLICATIONS INC MONTROSE CO

(U) Approximating Distributions from Moments,

NOV 87

PERSONAL AUTHORS: Pawula, R. F.

CONTRACT NO. F49620-85-C-0093

MONITOR: AFOSR  
TR-88-0337

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review A, v36 n10  
p4996-5007, 15 Nov 87.

ABSTRACT: (U) A method based upon Pearson-type approximations from statistics is developed for approximating a symmetric probability density function from its moments. The extended Fokker-Planck equation for non-Markov processes is shown to be the underlying foundation for the approximations. The approximation is shown to be exact for the beta probability density function. The applicability of the general method is illustrated by numerous pithy examples from linear and nonlinear filtering of both Markov and non-Markov dichotomous noise. New approximations are given for the probability density function in two cases in which exact solutions are unavailable, those of the filter-limiter-filter problem and second-order Butterworth filtering of the random telegraph signal. The approximate results are compared with previously published Monte Carlo simulations in these two cases.

DESCRIPTORS: (U) \*FOKKER PLANCK EQUATIONS, \*PROBABILITY DENSITY FUNCTIONS, APPROXIMATION(MATHEMATICS), LINEAR FILTERING, MOMENTS, MONTE CARLO METHOD, NONLINEAR SYSTEMS, SIGNALS, SIMULATION, SYMMETRY, TELEGRAPH SYSTEMS, MATHEMATICAL FILTERS.

IDENTIFIERS: (U) Pearson approximation, Butterworth filtering, Nonlinear filtering, WUAFOSR2304A5, PB81102F.

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AD-A193 483 8/4 8/5

TULANE UNIV NEW ORLEANS LA DEPT OF PHYSIOLOGY

(U) Interactions Among Hippocampal Neurons and Synchronization Leading to Epileptiform Bursts,

87 11P

PERSONAL AUTHORS: Dudek, F. E.; Christian, Edward P.

CONTRACT NO. AFOSR-85-0317

PROJECT NO. 2312

TASK NO. K2

MONITOR: AFOSR  
TR-88-0237

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inactivation of Hypersensitive Neurons, p147-156 1987.

ABSTRACT: (U) A fundamental component of epileptiform activity is synchronous bursting within a population of cortical neurons. In vitro preparations of mammalian nervous tissue (in particular, slices of hippocampus) have provided direct evidence for and detailed analyses of local neuronal interactions. Four distinct mechanisms of neuronal interaction may contribute to the local synchronization of electrical activity: a) recurrent excitatory chemical synapses, b) electronic coupling through gap junctions, c) electrical field effects (i.e., ephaptic interactions), and d) changes in the concentration of extracellular ions (e.g., potassium (+) and calcium (2+)). The aim of this chapter will be to review briefly some of the evidence concerning possible importance of the first three mechanisms (a-c) in the hippocampus. Emphasis will be on evidence that these mechanisms contribute to synchronization of electrical activity during hyperactive states, such as those produced by treating hippocampal slices with picrotoxin (PTX) or low-Ca(2+) solutions. (Reprints)

DESCRIPTORS: (U) \*HIPPOCAMPUS, \*NERVE CELLS, CALCIUM, COUPLING(INTERACTION), ELECTRIC FIELDS, ELECTRONICS, IN VITRO ANALYSIS, INTERACTIONS, NERVES, POTASSIUM, PREPARATION, REPRINTS, SYNAPSE, ISSUES(BIOLOGY).

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TULANE UNIV NEW ORLEANS LA DEPT OF PHYSIOLOGY

IDENTIFIERS: (U) \*Epileptiform bursts, Evoked potential,  
Synchronization, PE61102F, WJAFOSR2312K2.

(U) Synaptic Activation of Slow Depolarization in Rat  
Supraoptic Nucleus Neurons In Vitro.

87

PERSONAL AUTHORS: Dudek, F. E.; Gribkoff, Valentin K.

CONTRACT NO. AFOSR-85-0317

PROJECT NO. 2312

TASK NO. K2

MONITOR: AFOSR  
TR-88-0240

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physiology, v387 p273-  
296 1987.

ABSTRACT: (U) The effects of synaptic activation on rat supraoptic nucleus (s.o.n.) neurons were studied in the hypothalamic slice preparation. In forty of forty-one cells, responses to single stimuli consisted of a short-latency excitatory post-synaptic potential (e.p.s.p.), which was often followed by a brief burst of fast depolarizing events which resembled spontaneous e.p.s.p.s. Brief trains of orthodromic stimuli produced three effects in most cells. All components of the response to dorsolateral stimulation could be reduced or blocked in low calcium (2+), high magnesium (2+) bathing medium. Slow depolarizations were observed when action potentials were not elicited by the stimulus train. In some cells antidromic stimulation at an intensity just suprathreshold for the recorded cell did not produce comparable bursts of fast depolarizing events or slow depolarizations; similar periods of depolarizing current injection, which produced repetitive discharge, also did not mimic the effects of orthodromic stimulation. The fast depolarizing events appear to reflect spontaneous e.p.s.p.s; increases in the frequency of these events may reflect the after-discharge of nearby neurons that are presynaptic to the recorded neurons. Repetitive synaptic activation produces an extrinsically generated slow depolarization that probably represents a slow e.p.s.p.

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or extracellular accumulation of ions.

DESCRIPTORS: (U) \*DEPOLARIZATION, \*SYNAPSE, \*NEUROCHEMISTRY, ACCUMULATION, ACTIVATION, CALCIUM, IONS, MAGNESIUM, RATS, REPRINTS, RESPONSE(BIOLOGY), STIMULI, NERVE CELLS, NERVE IMPULSES, STIMULATION(PHYSIOLOGY), NERVE TRANSMISSION, HYPOTHALAMUS.

IDENTIFIERS: (U) \*Supraoptic neurons, Neuroendocrine cells, PE61102F, WJAFOSR2312K2.

YALE UNIV NEW HAVEN CONW SCHOOL OF MEDICINE

(U) Limits of Pattern Discrimination in Human Vision.

DESCRIPTIVE NOTE: Annual technical rept. 1 Jan 87-1 Jan 88,

JAN 88 14P

PERSONAL AUTHORS: Hirsch, Joy

CONTRACT NO. AFOSR-86-0077

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-88-0375

UNCLASSIFIED REPORT

ABSTRACT: (U) The three specific aims of this current ongoing project include: 1) the characterization of the human and monkey photoreceptor lattice; 2) the study of new spatial discriminations in two-dimensions including circle center, area, and dot density discriminations, and 3) the expansion and generalization of current models of one-dimensional spatial discriminations such as spatial-frequency, line separation, and vernier acuity.

DESCRIPTORS: (U) \*DISCRIMINATION, \*PATTERN RECOGNITION, \*VISUAL PERCEPTION, \*SPATIAL DISTRIBUTION, CIRCLES, HUMANS, MODELS, ONE DIMENSIONAL, VISION, PHOTORECEPTORS, TWO DIMENSIONAL, MONKEYS, RETINA, VISUAL ACUITY.

IDENTIFIERS: (U) PE61102F, WJAFOSR2313A5.

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OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

(U) Bayesian Design and Analysis of Accelerated Life Testing with Step Stress.

IDENTIFIERS: (U) PEG1102F, WUAFOSR2304K3.

DESCRIPTIVE NOTE: Technical rept. 1 Jul 84-31 Dec 86,

AUG 86 21P

PERSONAL AUTHORS: Degroot, Morris H.; Goel, Prem K.

REPORT NO. TR-350

CONTRACT NO. AFOSR-84-0182

PROJECT NO. 2304

TASK NO. K3

MONITOR: AFOSR  
TR-88-0508

UNCLASSIFIED REPORT

ABSTRACT: (U) An accelerated life testing problem in which the stress s can take only a fixed, finite number of values is known as accelerated life test with step stress. In general, the item under test is started under the lowest stress first and if an item has not failed until a certain specified time, then it is moved into the next level of stress. This process is continued until the item fails. Thus the life test duration of the item is shortened. A Bayesian formulation of the problem is given in this paper. It is assumed that there only two stress values under consideration (1) standard use environmental condition (11) a higher level of stress that is fixed in advance and is the same for all items to be tested. However, the time at which an item on test is taken out of use environment and put under higher stress environment can be chosen by the experimenter subject to a cost structure. We consider the inference and the optimal design problem of when the change the stress as the test progress. Keywords: Accelerated life test, Step stress, Optimal design, Bayesian approach.

DESCRIPTORS: (U) \*ACCELERATED TESTING, \*LIFE TESTS, BAYES THEOREM, COSTS, FORMULATIONS, OPTIMIZATION, STRESSES, TIME.

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AD-A193 433 11/2

MASSACHUSETTS INST OF TECH CAMBRIDGE

CHICAGO UNIV IL

(U) Growing Ion Holes as the Cause of Auroral Double Layers.

(U) Micromechanics of Concrete.

FEB 88

JAN 88 41P

PERSONAL AUTHORS: Tetremutt, David J.

PERSONAL AUTHORS: Krajcinovic, Dusan

CONTRACT NO. F49620-88-C-0128

REPORT NO. 2-5-30353

PROJECT NO. 3484

CONTRACT NO. AFOSR-88-0030

TASK NO. A2

PROJECT NO. 2302

MONITOR: AFOSR  
TR-88-0300

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-88-0255SUPPLEMENTARY NOTE: Pub. in Geophysical Research Letters,  
v15 n2 p164-167 Feb 88.

UNCLASSIFIED REPORT

ABSTRACT: (U) The nonlinear ion-hole instability is proposed as the cause of intermittent double layers observed in the auroral particle acceleration region. A novel feature of the instability is its occurrence in plasma that is stable to linear ion acoustic waves. A growing ion-hole has a double layer potential structure. We demonstrate here that nonlinear hole instability is consistent with S3-3 and Viking satellite data. Instability thresholds, as well as characteristic double layer amplitudes, potential drops, speeds, and scale sizes are calculated. The inadequacy of conventional laser instability models in explaining the data is discussed. Keywords: Double layers; Auroral field aligned currents; Ion holes; Reprints.

DESCRIPTORS: (U) \*AURORAE, \*ELECTRIC DOUBLE LAYER, ACOUSTIC WAVES, AMPLITUDE, HOLES(OPENINGS), IONS, LASERS, LAYERS, LINEARITY, MODELS, REPRINTS, SIZES(DIMENSIONS), STABILITY, WAVES, ELECTROM ENERGY.

IDENTIFIERS: (U) Ion acoustic waves, S3-3 Satellite, Viking satellite, PE81102F, WJAFOSR3484A2.

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ABSTRACT: (U) This Final Report summarizes the research conducted at the University of Illinois at Chicago by the author and several of his graduate students. The research was focused on the establishment of a rational constitutive model for concrete based on the actual mesostructural kinetics. The results clearly demonstrate that a constitutive model of the proposed type is not only feasible but also that the attendant computations are moderate in volume. The proposed model is illustrated on several simple examples in the referenced literature. Keywords: Continuum damage mechanics, Micromechanics, Concrete.

DESCRIPTORS: (U) \*CONCRETE, COMPUTATIONS, CONTINUUM MECHANICS, DAMAGE, DOCUMENTS, MECHANICS, STUDENTS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2302C2.



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AD-A193 431 CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE CENTER FOR SPACE RESEARCH

REPRINTS.

IDENTIFIERS: (U) \*Ion conic formation.

AD-A193 431 4/1

(U) Lower Hybrid Ion Conics,

NOV 87

PERSONAL AUTHORS: Crew, G. B.; Chang, Tom

CONTRACT NO. F49620-88-C-0128

PROJECT NO. 3484

TASK NO. A2

MONITOR: AFOSR  
TR-88-0314

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physics of Space Plasmas, v8  
p55-78 Nov 87.

ABSTRACT: (U) A theoretical overview of the formation of ion conic velocity distributions is presented for those situations where the necessary ion heating is attributable to wave-particle interaction with lower hybrid turbulence. Based on a discussion of the observations and the probable heating scenario, the relevant physics is abstracted to construct a mathematical model for the conic formation process. The discussion includes a brief tutorial covering the essentials of wave-particle interactions with these waves. While for the general case one must be content with a numerical solution to the problem, in some instances approximate analytic solutions may be obtained using asymptotic methods. These results are discussed in some detail, and important conclusions for the interpretation of observational data are drawn. Keywords: Ion conics, Lower hybrid waves, Analytical, Numerical solutions.

DESCRIPTORS: (U) \*IONS, \*IONOSPHERE, ASYMPTOTIC SERIES, CONICAL BODIES, DISTRIBUTION, HEATING, HYBRID SYSTEMS, INTERACTIONS, MATHEMATICAL ANALYSIS, MATHEMATICAL MODELS, METHODOLOGY, NUMERICAL ANALYSIS, PARTICLES, ATMOSPHERIC PHYSICS, PROBABILITY, SOLUTIONS(GENERAL), TURBULENCE, VELOCITY, PLASMA WAVES, MONTE CARLO METHOD, GEOMAGNETISM, MAGNETOSPHERE, MAGNETIC FIELDS, ALIGNMENT, TRANSVERSE.

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TEXAS TECH UNIV LUBBOCK DEPT OF MECHANICAL ENGINEERING

(U) Nonlinear Stochastic Interaction in Aeroelastic Structures.

DESCRIPTIVE NOTE: Final rept. 1 Nov 84-31 Dec 87,

JAN 88

PERSONAL AUTHORS: Ibrahim, Raouf A.

CONTRACT NO. AFOSR-85-0008

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-88-0388

UNCLASSIFIED REPORT

ABSTRACT: (U) The linear and nonlinear modal interactions in aeroelastic structures under wide band random excitation are examined analytically and experimentally. The analytical investigation deals with the random response characteristics of two- and three-degree-of-freedom nonlinear models in the neighborhood of internal resonance conditions. These conditions take the form of linear relationships between the normal mode frequencies and are established from the linear modal analysis of each model. The Fokker-Planck equation approach is used to derive a general differential equation for the response joint moments. In view of the models nonlinearity the differential equation is found to constitute a set of infinite coupled first order differential equations. These equations are closed by using two different truncation schemes which are based on the properties of response joint cumulants. These two schemes are known as Gaussian and non-Gaussian closures. The analytical manipulations are performed by using the computer algebraic software MACSYMA, while the response statistical moments are determined by numerical integration by using the IMSL software DVERK. The Gaussian closure solution gives a quasi-stationary response in the form of fluctuations between two limits. However, the non-Gaussian closure results in a strict stationary response. The general trend of the nonlinear

interaction takes the form of energy exchange between the interacted modes when the system is internally tuned.

DESCRIPTORS: (U) \*FOKKER PLANCK EQUATIONS, AEROELASTICITY, ALGEBRA, BROADBAND, CLOSURES, COMPUTER PROGRAMS, DIFFERENTIAL EQUATIONS, ENERGY TRANSFER, EXCITATION, FREQUENCY, INTERACTIONS, LINEAR SYSTEMS, MATHEMATICAL ANALYSIS, MATHEMATICAL MODELS, MOMENTS, NONLINEAR SYSTEMS, NUMERICAL INTEGRATION, RESONANCE, RESPONSE, STATIONARY, STATISTICS, STOCHASTIC PROCESSES, STRUCTURES, TRUNCATION.

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B1.

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AD-A193 426 CONTINUED

PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

(U) Reactions of Organonitrogen Molecules with Ni(100).

88 11P

PERSONAL AUTHORS: Schoofs, Gregory R.; Benziger, Jay B.

CONTRACT NO. AFOSR-88-0050

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-88-0313

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
v92 n3 p741-750 1988.

ABSTRACT: (U) The adsorption and reaction of a variety of organonitrogen compounds on a Ni(100) surface have been examined with temperature-programmed reaction, Auger electron spectroscopy, and infrared spectroscopy. Monomethylamine adsorbs via the nitrogen lone pair of electrons and then undergoes C-N bond scission yielding adsorbed carbon, dihydrogen, and ammonia. Aniline pi-bonds to the surface and polymerizes to form a thermally stable poly(aniline) surface film. Pyridine undergoes a temperature-induced orientational transformation. At low temperatures pyridine adsorbs with its ring parallel to the surface. At higher temperatures it appears to form an alpha-pyridyl species with an activation barrier of 85 kJ/mol. Methyl groups on 2,6-lutidine sterically hinder this reaction. Methyl groups on 3,5-lutidine stabilize bonding via the nitrogen lone pair of electrons. The methyl groups on 3,5-lutidine increase electrophilic addition activity relative to pyridine and lead to polymerization of 3,5-lutidine, forming a thermally stable polymer film. Pyrimidine reacted in almost identical fashion to pyridine, suggesting that increased nucleophilic activity had little effect on the reaction behavior of heterocyclic compounds and that electrophilic reactions predominate. Keywords: Organonitrogen, Nickel, Infrared spectroscopy, Pyridine, Lutidines, Surface polymerization.

DESCRIPTORS: (U) \*NICKEL, \*ORGANIC NITROGEN COMPOUNDS, ADDITION REACTIONS, ADSORPTION, AMMONIA, AUGER ELECTRON SPECTROSCOPY, BEHAVIOR, CARBON, HETEROCYCLIC COMPOUNDS, INFRARED SPECTROSCOPY, POLYMERIC FILMS, POLYMERIZATION, PYRIDINES, THERMAL STABILITY, AROMATIC COMPOUNDS, TRANSITION METALS, SURFACE CHEMISTRY.

IDENTIFIERS: (U) PEB1102F, WJAFOSR2303A2.

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KANSAS UNIV LAWRENCE

RANDOM APPLICATIONS INC MONTROSE CO

(U) Demodulation Processes in Auditory Perception.

DESCRIPTIVE NOTE: Annual rept. 1 Dec 86-30 Nov 87,

MAR 88 5P

NOV 87 9P

PERSONAL AUTHORS: Feth, Lawrence L.

PERSONAL AUTHORS: Pawula, Robert F.; Rice, Steven O.

CONTRACT NO. AFOSR-87-0081

CONTRACT NO. F49620-85-C-0083

PROJECT NO. 2313

PROJECT NO. 2304

TASK NO. A6

TASK NO. A5

MONITOR: AFOSR

MONITOR: AFOSR  
TR-88-0338

TR-88-0376

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The attached interim report covers the first 12 month period of the project. A signal-processing computer model of human auditory perception of complex, time-varying sounds has been revised to incorporate the ability to follow a frequency that changes over time. Such frequency changes are thought to convey the information important for the perception of speech, music and other important sounds. Testing of the revised model is underway using a two alternative forced choice discrimination task. Listeners are required to distinguish between a sound with a smooth linear frequency glide and another covering the same trajectory in a series of discrete steps. We expect to determine the temporal parameters for the revised model from these discrimination experiments.

**DESCRIPTORS:** (U) \*AUDITORY PERCEPTION, \*COMPUTERIZED SIMULATION, \*SPEECH, DEMODULATION, DISCRIMINATION, FREQUENCY, HUMANS, LINEARITY, MUSIC, PERCEPTION(PSYCHOLOGY), SIGNAL PROCESSING, SOUND, TIME, TRAJECTORIES, VARIATIONS, COMPUTER PROGRAMS.

**IDENTIFIERS:** (U) PE81102F, WUAFOSR2313A6.

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**SUPPLEMENTARY NOTE:** Pub. in IEEE Transactions on Information Theory, VIT-33 no p882-888 Nov 87.

**ABSTRACT:** (U) A method is developed for calculating the probability density function  $p(y)$  of the output of an RC filter when the input is a particular kind of random telegraph wave. The method makes use of a computer to determine the numerical values of the coefficients in two series solutions, one of which contains a logarithm, of a fourth-order linear differential equation. The constants of integration are determined from the boundary conditions by a procedure that involves a summation of the series. Representation values and curves of  $p(y)$  are presented, and the generality of the computer method is discussed briefly. **Keywords:** Probability density function; Random telegraph wave; Fokker Planck approximation; Series solution; Reprints.

**DESCRIPTORS:** (U) \*DIFFERENTIAL EQUATIONS, \*PROBABILITY DENSITY FUNCTIONS, \*SOLUTIONS(GENERAL), \*TELEGRAPH SYSTEMS, \*WAVES, BOUNDARIES, COEFFICIENTS, COMPUTERS, CONSTANTS, INTEGRATION, REPRINTS, SERIES(MATHEMATICS), VALUE.

**IDENTIFIERS:** (U) PE81102F, WUAFOSR2304A5.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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GEORGIA INST OF TECH ATLANTA SCHOOL OF INDUSTRIAL AND  
SYSTEMS ENGINEERING

(U) Equitable Transit Charges for Multi-Administration  
Telecommunications Networks,

87 11P

DESCRIPTORS: (U) \*COMMUNICATIONS NETWORKS,  
\*TELECOMMUNICATION CIRCUITS, BLOCKING, CIRCUITS, COSTS,  
INTERNATIONAL, NETWORKS, NODES, NUMBERS, OPTIMIZATION,  
PROBABILITY, QUEUEING THEORY, REPRINTS, SHARING.

IDENTIFIERS: (U) \*Transit charges(Telecommunications),  
PEG1102F, WUAFOSR2304A5.

PERSONAL AUTHORS: Serfozo, Richard F.

CONTRACT NO. AFOSR-84-0387

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-88-0332

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Queueing Systems, V2 p83-92  
1987.

ABSTRACT: (U) We study a multi-administration telecommunications network that is an abstraction of an international network. The nodes represent separate telecommunications administrations that are linked such that alternately-routed calls go through one tandem administration. The cost of the group of circuits between a pair of administrations is borne by them; and when a call between the pair is alternately routed through the tandem node, then the two administrations share the call revenue and pay transit fees to the tandem administration. The numbers of circuits between the administrations are selected to yield a least-cost network that provides a desired level of service, in terms of blocking probabilities, over an entire day. We address the problem of determining transit charges for the alternately-routed calls that are equitable for all of the administrations. Our approach is to derive such charges by equating the system-optimal circuit group sizes to certain hypothetical administration-optimal circuit group sizes. This approach may be of use in other system design problems involving cost sharing among several companies. Keywords: Telecommunications networks; Optimal design; Equitable charges; Queueing systems.

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PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

CALIFORNIA UNIV SAN FRANCISCO

(U) Asymptotic Normality of Minimum L1-Norm Estimates in Linear Models.

(U) Molecular Interactions between DNA, Poly(ADP-ribose) Polymerase, and Histones.

DESCRIPTIVE NOTE: Technical rept.,

JAN 88 9P

SEP 87 36P

PERSONAL AUTHORS: Sastry, Srinivas S.; Kun, Ernest

PERSONAL AUTHORS: Bai, Z. D.; Chen, X. R.; Wu, Y.; Zhao, L. C.

CONTRACT NO. AFOSR-85-0377, \$AFOSR-85-0084

REPORT NO. TR-87-35

PROJECT NO. 2312

CONTRACT NO. N00014-85-K-0292, F49620-85-C-0008

TASK NO. A5

PROJECT NO. 2308

MONITOR: AFOSR  
TR-88-0338

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-88-0202

SUPPLEMENTARY NOTE: Pub. in Jnl. of Biological Chemistry, V283 n3 p1505-1512, 25 Jan 88.

UNCLASSIFIED REPORT

ABSTRACT: (U) This document considers a standard linear regression model with assumed known p-vectors, unknown p-vectors of regression coefficients, and an independent random error sequence each having a median zero. Keywords: Minimization problem; Least squares estimates.

ABSTRACT: (U) Molecular interactions between purified poly(ADP-ribose) polymerase, whole thymus histones, histone H1, rat fibroblast genomic DNA, and closed circular and linearized SV40 DNA were determined by the nitrocellulose filter binding technique. Binding of the polymerase protein or histones to DNA was augmented were present simultaneously. The polymerase protein also associated with histones in the absence of DNA. The cooperative or promoted binding of histones and the enzyme to relaxed covalently closed circular SV40 DNA was greater than the binding to the linearized form. Binding of the polymerase to SV40 DNA fragments in the presence of increasing concentrations of sodium chloride indicated a preferential binding to two restriction fragments as compared to the others. Polymerase binding to covalently closed relaxed SV40 DNA resulted in the induction of superhelicity. The simultaneous influence of the polymerase and histones on DNA topology were more than additive. Topological constraints on DNA induced by poly(ADP-ribose) polymerase were abolished by auto ADP-ribosylation of the enzyme. Benzamide, by inhibiting poly(ADP-ribosylation), reestablished the effect of the polymerase protein on DNA topology. Polymerase binding to in vitro-assembled core particle-like nucleosomes was also demonstrated. (Reprints)

DESCRIPTORS: (U) \*ASYMPTOTIC NORMALITY, \*LINEAR REGRESSION ANALYSIS, \*MATHEMATICAL MODELS, ERRORS, ESTIMATES, LEAST SQUARES METHOD, LINEARITY, SEQUENCES, MULTIVARIATE ANALYSIS, DISTRIBUTION FUNCTIONS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5.

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NEW YORK UNIV N Y

DESCRIPTORS: (U) \*DEOXYRIBONUCLEIC ACIDS, \*HISTONES,  
\*MOLECULE MOLECULE INTERACTIONS, \*PHOSPHORUS TRANSFERASES,  
ADHESION, AMIDES, BENZENE, CONCENTRATION (COMPOSITION),  
ENZYMES, FILTERS, FRAGMENTS, NITROCELLULOSE, REPRINTS,  
SODIUM CHLORIDE, THYMUS, TOPOLOGY, CHEMICAL BONDS,  
MOLECULAR BIOLOGY, GENES.

(U) Cognitive and Neural Bases of Skilled Performance.

DESCRIPTIVE NOTE: Annual technical rept. Sep 86-Sep 87.

OCT 87 179P

IDENTIFIERS: (U) PE81102F, WUAFOSR2312A5.

PERSONAL AUTHORS: Kaufman, Lloyd

CONTRACT NO. F49620-86-C-0131

PROJECT NO. 3484

TASK NO. A4

MONITOR: AFOSR  
TR-87-1710

UNCLASSIFIED REPORT

ABSTRACT: (U) Research in seven interrelated areas has been carried out during this first year. A major advance in the capability of neuromagnetic monitoring of higher levels of brain function was achieved with the installation of a large magnetically shielded room for the sensing system. This together with a computer-controlled adaptive filter dramatically improved sensitivity to slowly-varying brain signals. A new analysis technique based on a multidimensional signal space has also been developed to characterize the neural configurations that give rise to differing field patterns, without restricting consideration to only the simplest that can be attributed to an equivalent current dipole. Successful application of these concepts to studies of the alpha rhythm also demonstrated a major advantage in using elements of the covariance matrix across sensors to reduce interference from extraneous neural sources, thereby improving the signal-to-noise ratio by an order of magnitude. In preparing for a series of collaborative studies, various methods for producing visual displays in the shielded room were evaluated, and one based on a single-lens TV projection system was chosen. The system can be controlled by a computer peripheral to the Hp9000/550 used to record and analyze neuromagnetic data. Software was successfully developed so that either an IBM/PC-compatible or Omega computer can be used for this purpose. An Adage 3000 frame buffer was obtained for

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psychophysical studies, and programs were developed to present a display where only color or only luminance changes are produced.

DESCRIPTORS: (U) \*COGNITION, \*PERCEPTION, \*PERFORMANCE(HUMAN), \*SKILLS, \*MAGNETOENCEPHALOGRAMS, ADAPTIVE FILTERS, BIOLOGICAL RHYTHMS, BRAIN, COLORS, COMPUTER APPLICATIONS, COMPUTER PROGRAMS, CONFIGURATIONS, CONTROL, DETECTORS, DISPLAY SYSTEMS, FUNCTIONS, INTERACTIONS, LUMINANCE, NERVOUS SYSTEM, PATTERNS, PSYCHOPHYSICS, SHIELDING, SIGNAL TO NOISE RATIO, SPACE(ROOM), VISUAL AIDS, BIOMAGNETISM, SPACE PERCEPTION, MEMORY(PSYCHOLOGY), LEARNING.

IDENTIFIERS: (U) Neuromagnetism, PEB1103D, WJAFQSR3484A4.

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) Joint Asymptotic Distribution of Marginal Quantiles and Quantile Functions in Samples from a Multivariate Population.

DESCRIPTIVE NOTE: Technical rept.,

OCT 87 18P

PERSONAL AUTHORS: Babu, C. J.; Rao, C. R.

REPORT NO. TR-87-42

CONTRACT NO. F49620-85-C-0008

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-88-0189

UNCLASSIFIED REPORT

ABSTRACT: (U) The joint asymptotic distributions of the marginal quantiles and quantile functions in samples from a p-variate population are derived. Of particular interest is the joint asymptotic distribution of the marginal sample medians on the basis of which tests of significance for population medians are developed. Methods of estimating unknown nuisance parameters are discussed. The approach is completely nonparametric. Keywords: Bootstrap method; multivariate analysis.

DESCRIPTORS: (U) \*ASYMPTOTIC SERIES, \*NONPARAMETRIC STATISTICS, \*STATISTICAL DISTRIBUTIONS, MULTIVARIATE ANALYSIS, POPULATION, MULTIVARIATE ANALYSIS, POPULATION(MATHEMATICS).

IDENTIFIERS: (U) Bootstrap method, PEB1102F.

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NEW YORK UNIV N Y

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) Method for Locating a Small Magnetic Object in the Human Body.

(U) Further Extensions of the Choquet-Deny and Deny Theorems With Applications in Characterization Theory.

FEB 88 15P

DESCRIPTIVE NOTE: Technical rept. for period ending Aug 87.

PERSONAL AUTHORS: Kaufman, Lloyd; Williamson, Samuel J.; Ilmonen, Risto J.; Weinberg, Harold; Boyd, Arthur D.

AUG 87 30P

CONTRACT NO. F49620-85-K-0004, \$PHS-NSI-9483-03

PERSONAL AUTHORS: Rao, C. R.; Shanbhag, D. N.

PROJECT NO. 2313

REPORT NO. TR-87-28

TASK NO. A4

CONTRACT NO. F49620-85-C-0008

MONITOR: AFOSR TR-88-0370

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFOSR TR-88-0204

ABSTRACT: (U) A piece of a thin acupuncture needle lodged under the right scapula of a patient could not be found in surgical procedures accompanied by studies of 30 standard X-ray images. To locate it, we mapped the magnetic field component normal to a plane lying above the object, using a superconducting quantum interference device (SQUID). Assuming that the needle could be modelled as a magnetic dipole, we were able to infer its lateral position, depth, orientation, and magnetic moment. With this information, directed CT scans, high-resolution X-ray films, and the subsequent surgical removal of the needle proved that it could be located in the body with an accuracy of about three millimeters.

DESCRIPTORS: (U) \*ACUPUNCTURE, \*NEEDLES, \*SURGERY, \*MAGNETIC DETECTION, ACCURACY, HIGH RESOLUTION, HUMAN BODY, INTERFERENCE, MAGNETIC FIELDS, MAGNETIC MOMENTS, QUANTUM THEORY, SUPERCONDUCTIVITY, X RAY FILM, SUPERCONDUCTORS.

IDENTIFIERS: (U) SQUID(Superconducting Quantum Interference Device), WUAFOSR2313A4, PE61102F.

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ABSTRACT: (U) This paper aims at extending the Davies-Shanbhag (1987) result to situations covering the problems considered by Shimizu (1978, 1980), Gu and Lau (1984) and Ramachandran et al (1987). Section 2, gives the results when  $H$  is bounded and micron is replaced by a certain bounded signed measure subsuming the specialized versions of the results given earlier by Shimizu (1978) and Ramachandran et al (1987); these turn out to be also extended versions of the Choquet-Deny theorem. Section 3 considers an extension of the Davies-Shanbhag result for the case of two simultaneous equations yielding the results of Ramachandran et al (1987) and those arrived at by some of the authors as special cases. Section 4 obtains extended versions of the results involving error terms given earlier by Shimizu (1980) and Gu and Lau (1984), and finally in Section 5, we discuss some applications. Keywords: Integrated cauchy functional equations.

DESCRIPTORS: (U) \*SIMULTANEOUS EQUATIONS, CAUCHY PROBLEM, ERROR ANALYSIS, FUNCTIONAL ANALYSIS, INTEGRATED SYSTEMS.

IDENTIFIERS: (U) Choquet Deny theorem, Deny theorem, Lau

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Rao theorem, Characterization theory, PE81102F,  
HUAFO5R2304A5.

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Neural Dynamics of Decision Making Under Risk:  
Affective Balance and Cognitive-Emotional Interactions.

87 21P

PERSONAL AUTHORS: Grossberg, Stephen; Gutowski, William E.

CONTRACT NO. F49820-86-C-0037, \$AFOSR-85-0149

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-88-0374

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Psychological Review, v94 n3  
p300-318 1987.

ABSTRACT: (U) A real-time neural network model, called affective balance theory, is developed to explain many properties of decision making under risk that heretofore have been analyzed using formal algebraic models, notably prospect theory. The model describes cognitive-emotional interactions that are designed to ensure adaptive responses to environmental demands but whose emergent properties nonetheless can lead to paradoxical and even irrational decisions in risky environments. Emotional processing in the model is carried out by an opponent processing network called a gated dipole. Learning enables cognitive representations to generate affective adaptation level, or context, against which later events are evaluated. Neutral events can become affectively charged either through direct activations or antagonistic rebounds within a previously habituated dipole. The theory describes the affective consequences of strategies in which an individual compares pairs of events or statements that are not necessarily explicitly grouped within the stimuli.

DESCRIPTORS: (U) \*COGNITION, \*DECISION MAKING, \*EMOTIONS, ACTIVATION, ADAPTATION, ADAPTIVE SYSTEMS, ALGEBRA, BALANCE, DYNAMICS, LEARNING, MATHEMATICAL MODELS, MODELS, NERVOUS SYSTEM, NETWORKS, NEURAL NETS, NEUTRAL.

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PROCESSING, REAL TIME, REPRINTS, RESPONSE, RISK, STIMULI,  
THEORY.

GENERAL ATOMICS SAN DIEGO CA

(U) Studies in Support of Oxidation-Resistant Composite  
Materials.

IDENTIFIERS: (U) PE81102F, WUAFOSR2313A5.

DESCRIPTIVE NOTE: Final rept. Nov 85-Dec 87,

FEB 88 134P

PERSONAL AUTHORS: Kase, J. L.; Dresselhaus, M.; MacKenzie,  
J.; McQuillan, B.; Price, R.

REPORT NO. GA-A19185

CONTRACT NO. F49620-88-C-0011

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-88-0284

UNCLASSIFIED REPORT

ABSTRACT: (U) Studies on elements required for oxidation  
resistant composite materials have been carried out in  
four areas: (1) Investigations of moisture resistant  
sealant glasses for carbon-carbon composite materials and  
their interactions with oxidation barrier coatings. (2)  
Investigations of the effects of electrochemical  
modification of carbon surfaces on the wetability of  
these surfaces by sealant glasses. (3) Investigations of  
alkoxides sol-gel precursors of ceramic materials. (4)  
Investigations of the formation of ceramic fibers through  
the oxidation of inter-calculated carbon fibers. Keywords:  
Oxidation resistant composite materials.

DESCRIPTORS: (U) \*CARBON CARBON COMPOSITES, \*COMPOSITE  
MATERIALS, \*OXIDATION RESISTANCE, BARRIER COATINGS,  
CERAMIC FIBERS, CERAMIC MATERIALS, ELECTROCHEMISTRY,  
GLASS, MODIFICATION, MOISTUREPROOFING, OXIDATION, SEALING  
COMPOUNDS, SURFACES.

IDENTIFIERS: (U) WUAFOSR2303A3, PE81102F.

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AD-A193 318 12/3

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF MATERIALS SCIENCE

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF ELECTRICAL  
ENGINEERING

(U) Outlier Resistant Filtering and Smoothing. 2D Version.

(U) Robust Prediction for Stationary Processes. 2D  
Enriched Version.

DESCRIPTIVE NOTE: Technol. rept. 2 JUL 87-30 JUN 88,

FEB 88

DESCRIPTIVE NOTE: Rept. for 1 JUL 87-30 JUN 88,

PERSONAL AUTHORS: Papantoni-Kazakos, P.; Tsaknakis,  
Haralamos

NOV 87 75P

PERSONAL AUTHORS: Papantoni-Kazakos, P.; Birmiwal,  
Kailash

REPORT NO. UVA/525682/EE88/104

CONTRACT NO. AFOSR-87-0224

REPORT NO. UVA/525682/EE88/103

PROJECT NO. 2304

CONTRACT NO. AFOSR-87-0224

TASK NO. A5

PROJECT NO. 2304

MONITOR: AFOSR

TASK NO. A6

TR-88-0362

MONITOR: AFOSR  
TR-88-0361

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) Consider a stationary Gaussian information process transmitted through an additive noise channel. The noise and information processes are mutually independent, and the noise process modeled as nominally Gaussian with additive outliers. For the above system model a theory is developed for outliers resistant filtering and smoothing operations. We then design specific such nonlinear operations, and we study their performance. The performance criteria are the asymptotic mean squared error at the Gaussian nominal model, the breakdown point, and the influence function. The proposed operations combine excellent performance at the nominal model with strong resistance to outliers.

**DESCRIPTORS:** (U) \*ACOUSTIC FILTERS, \*KALMAN FILTERING, CHANNELS, INFORMATION PROCESSING, MODELS, NOISE, NONLINEAR SYSTEMS, RESISTANCE, STATIONARY, PROBABILITY DISTRIBUTION FUNCTIONS, RECURSIVE FILTERS.

**IDENTIFIERS:** (U) Outliers, noisy data, \*Nonlinear filters, WUAFOSR2304A5, PE81102F.

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## UNCLASSIFIED REPORT

**ABSTRACT:** (U) Consider prediction for stationary processes, in environments where data outliers may be present. Two sequences are developed for outliers resistant prediction operations, which are uniformly qualitatively robust. The asymptotic mean-squared performance of the developed operations are studied in the absence of data outliers. Important performance characteristics studied include the breakdown point and the influence function. Included are numerical results, for some autoregressive nominal processes.

**DESCRIPTORS:** (U) \*STATISTICAL PROCESSES, \*MATHEMATICAL PREDICTION, NUMERICAL ANALYSIS, PREDICTIONS, RESISTANCE, SEQUENCES, CHARTS, TABLES (DATA), ASYMPTOTIC NORMALITY.

**IDENTIFIERS:** (U) Outliers, WUAFOSR2304A6, PE81102F.

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EUROPEAN NUCLEAR ENERGY AGENCY PARIS (FRANCE)

control, WJAFDSR2302B1, PE61102F.

(U) Vibration Control of Large Structures.

DESCRIPTIVE NOTE: Final rept. 1 Jan 88-31 Dec 87.

MAR 88 48P

PERSONAL AUTHORS: Pilkev, Walter D.

REPORT NO. UVA/525673/MAE88/103

CONTRACT NO. F49620-86-K-0009

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-88-0369

UNCLASSIFIED REPORT

ABSTRACT: (U) This is a study of some fundamental aspects of the structural dynamics and vibration control of large structures. One focus is the development of a limiting performance formulation with minimum settling time which can accept multiple design objectives efficiently. This new formulation is intended to meet the need of rather comprehensive design objectives for the control of large space structures. Another objective of the study is to develop a systematic way of designing a control system based on the limiting performance characteristics. An indirect synthesis method is proposed. It is shown that closed loop control laws can be based on the optimal response trajectories in the time domain. The method is successfully applied to the control of proof-mass actuators. Keywords: Damping; Vibration controls; Feedback control laws; Optimal closed loop eigenvalues.

DESCRIPTORS: (U) \*DAMPING, \*STRUCTURES, \*VIBRATION, CLOSED LOOP SYSTEMS, CONTROL, CONTROL SYSTEMS, CONTROL THEORY, DYNAMICS, EIGENVALUES, FEEDBACK, FORMULATIONS, LIMITATIONS, OPTIMIZATION, RESPONSE, SPACECRAFT, STRUCTURAL PROPERTIES, SYNTHESIS, TIME DOMAIN, TRAJECTORIES.

IDENTIFIERS: (U) \*Large space structures, \*Vibrational

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AT AND T BELL LABS MURRAY HILL NJ DEPT OF MOLECULAR  
BIOPHYSICS

(U) Immunocytochemical and Electrophysiological  
Differentiation of Rat Cerebellar Granule Cells in  
Explant Cultures.

MAY 87 15P

PERSONAL AUTHORS: Hockberger, Philip E.; Yseng, Hsiu-Yu;  
Connor, John A.

CONTRACT NO. F49620-85-C-0309

PROJECT NO. 2312

TASK NO. K2

MONITOR: AFOSR  
TR-88-0282

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. 20 unl. of Neuroscience, v7 n5  
p1370-1383 May 87.

ABSTRACT: (U) We have used a combination of immunocytochemical and electrophysiological measurements to monitor the differentiation of cerebellar granule cells in vitro. We present immunocytochemical evidence showing that several characteristic features of developing rat cerebellar tissue were retained in postnatal explant cultures. Most notably the cultures expressed radiating GFAP-positive (Bergmann) glia processes, proliferating NSE-negative neuroblasts, and migrating NSE-positive granule cells. The latter were subdivided into 3 developmental stages - i.e., immature, intermediate, and mature granule cells, based upon cell differences in location from the explant, intensity of NSE staining, excitability, and the amplitude of voltage-dependent conductances. Immature cells were identifiable during the first week in culture and were located up to 140 micro meters from the explant. These cells stained lightly for NSE and displayed conductances of insufficient magnitude to generate action potentials. Intermediate cells were present after 1-2 weeks in culture and were located up to 500 micro meters from the explant. These cells were also NSE positive and were

characterized by the presence of soma action potentials. Intermediate cells displayed 3 large voltage-dependent conductances: a transient, TTX-sensitive inward current; a delayed, TEA-sensitive outward current; and a transient, 4AP-sensitive outward current. Reprints.

DESCRIPTORS: (U) \*CYTOCHEMISTRY, \*ELECTROPHYSIOLOGY,  
\*NERVE CELLS, DISPLAY SYSTEMS, MEASUREMENT, MONITORING,  
REPRINTS, RATS, IMMUNOCHEMISTRY, NERVE TRANSMISSION,  
CEREBELLUM.

IDENTIFIERS: (U) \*Granule cells, PE81102F, WUAFOSR2312K2.

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AT AND T BELL LABS MURRAY HILL NJ DEPT OF MOLECULAR  
BIOPHYSICS

MEMBRANES(BIOLOGY), REPRINTS, RESPONSE(BIOLOGY), SALTS,  
VERTEBRATES, NERVE TRANSMISSION, NEUROCHEMISTRY,  
INHIBITORS, BUTYRIC ACIDS, IMMUNOCHEMISTRY.

(U) Depolarization- and Transmitter-Induced Changes in  
Intracellular  $Ca^{2+}$  of Rat Cerebellar Granule Cells in  
Explant Cultures.

IDENTIFIERS: (U) GABA(Gamma Aminobutyric Acid), Calcium  
channels, PE61102F, WJAFDSR2312K2.

MAY 87 18P

PERSONAL AUTHORS: Hockberger, Philip E.; Tseng, Hsiu-Yu;  
Connor, John A.

CONTRACT NO. F49620-85-C-0008

PROJECT NO. 2312

TASK NO. K2

MONITOR: AFOSR  
TR-88-0260

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Neuroscience, v7 n5  
p1384-1400 May 87. Original contains color plates: All  
DTIC and NTIS reproductions will be in black and white.

ABSTRACT: (U) In the preceding paper (Hockberger et al.,  
1987) we described the development of  
electrophysiological and immunocytochemical  
characteristics of cerebellar granular cells maintained  
in explant culture. Although inward and outward currents  
of different types were described using whole-cell patch  
recording, it was difficult to make any clear  
demonstration of a  $Ca$  current. The intracellular free  $Ca$   
levels and membrane potential responses of cultured  
granule cells were also examined following application of  
various neurotransmitter-like molecules. We have  
concentrated our efforts on testing GABA and glutamate,  
since cerebellar granule cells contain receptors to these  
transmitters in vivo. We were particularly interested in  
determining whether there was any coupling (either  
positive or negative) between the inhibitory transmitter,  
GABA, and  $Ca$  influx, as has been suggested for other  
vertebrate neurons.

DESCRIPTORS: (U) \*CYTOCHEMISTRY, \*DEPOLARIZATION, \*NERVE  
CELLS, DEMONSTRATIONS, GLUTAMIC ACID, IN VIVO ANALYSIS,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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AD-A193 304 CONTINUED

CALIFORNIA UNIV IRVINE DEPT OF PHARMACOLOGY

(U) Neuronal Mechanisms of Intelligence.

DESCRIPTIVE NOTE: Final technical rept. 1 Sep 88-31 Aug 87.

NOV 87 38P

Important similarities and differences. Keywords: Conditioning(Learning).

DESCRIPTORS: (U) \*INTELLIGENCE, \*NERVE CELLS, \*PROBLEM SOLVING, \*CONDITIONING(LEARNING), ADAPTATION, BEHAVIOR, BIOCHEMISTRY, BRAIN, COMPARISON, CYTOLOGY, DETERMINATION, FUNCTIONS, HUMANS, CONDITIONED RESPONSE, HIPPOCAMPUS, DOPAMINE, COCAINE, STIMULATION(PHYSIOLOGY).

PERSONAL AUTHORS: Stein, Larry; Belluzzi, James D.

IDENTIFIERS: (U) WUAFOSR2312A1, PE81102F.

CONTRACT NO. AFOSR-84-0325

PROJECT NO. 2312

TASK NO. A1

MONITOR: AFOSR  
TR-88-0371

UNCLASSIFIED REPORT

ABSTRACT: (U) This research program is based on the assumption that human problem-solving behavior has evolved from the goal-seeking brain functions of lower forms. These functions in turn depend on a capacity for behavior to be strengthened or positively reinforced by its consequences, a process Skinner (1938) terms operant conditioning. A critical problem is to identify the functional brain unit whose activity is modified by the reinforcement process. Our early work suggests that the individual brain cell may serve as such a functional unit, leading us to identify the 'reinforced' neuron rather than the neuronal network as the unit of goal-seeking behavior. If these assumptions are correct, it follows that the fundamental mechanisms of adaptation underlying human intelligence reside at least in part at the level of individual cells. Elucidation of the cellular mechanisms of operant conditioning may have important implications for adaptive network research. Specific objectives of this research included: (1) demonstration that the activity of individual neurons in fact is susceptible to operant conditioning, (2) determination of the properties and limits of such neuronal operant conditioning, (3) investigation of the biochemical events that may mediate the cellular reinforcement process, and (4) comparison of the properties of neuronal and behavioral operant conditioning in order to determine

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CITY COLL NEW YORK INST FOR ULTRAFAST SPECTROSCOPY AND LASERS

CdS(x)Se(1-x).

(U) Ultrafast Physics in Semiconductor Microstructures.

DESCRIPTORS: (U) \*PHOTOLUMINESCENCE, \*QUANTUM THEORY, \*SEMICONDUCTORS, BOSONS, GALLIUM ARSENIDES, HIGH RATE, HOLES(ELECTRON DEFICIENCIES), MICROSTRUCTURE, PHONONS, PHYSICS, QUANTUM ELECTRONICS, RECOMBINATION REACTIONS, RELAXATION, SHOCK WAVES, ALUMINUM GALLIUM ARSENIDE, CADMIUM SELENIDES, SULFUR COMPOUNDS, GLASS.

DESCRIPTIVE NOTE: Annual progress rept. 1 Dec 86-30 Nov 87.

FEB 88 108P

IDENTIFIERS: (U) \*quantum wells, Semiconductor microstructures, WUAFOSR2305C1, PEB1102F.

PERSONAL AUTHORS: Alfano, Robert

REPORT NO. RF-447230

CONTRACT NO. AFOSR-86-0031

PROJECT NO. 2305

TASK NO. C1

MONITOR: AFOSR  
TR-88-0301

UNCLASSIFIED REPORT

ABSTRACT: (U) Analyzed is picosecond photoluminescence data obtained from quasi-two- and quasi-zero-dimensional electron systems in GaAs/AlGaAs multiple quantum wells and CdSe/glass spherical quantum wells. Important results are: (i) nonequilibrium phonons produced in the energy relaxation process of quasi-two-dimensional carriers in a vicinity of phonon wave number  $q$  sub  $e$  could behave like coherent Bosons within a short time period. The effects of nonequilibrium phonons for photogenerated carriers in undoped GaAs quantum wells are to slow the energy relaxation and to shorten the recombination lifetime. (ii) Electron-hole recombination dynamics in quasi-0D was interpreted based on the carrier confinement model. Ultrafast expansion of carriers in asymmetric GaAs quantum wells as observed under picosecond excitation. Dynamical changes in the band structure of GaAs and GaSe were measured under shock waves. Effects of nonequilibrium phonons on the energy relaxation and recombination lifetime of photogenerated carriers in undoped GaAs quantum wells; Observation of ultrafast lateral expansion of energetic carriers in an asymmetric GaAs quantum well; Electron-hole recombination lifetimes in a quasi-two-dimensional electron system in

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COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

MICHIGAN UNIV ANN ARBOR

(U) Picosecond Laser Studies of Excited State Processes.

(U) IEEE International Symposium on Information Theory (ISIT): Abstracts of Papers, Held in Ann Arbor, Michigan on 8-9 October 1986.

DESCRIPTIVE NOTE: Final rept. 1 Oct 84-30 Sep 87,

87

DESCRIPTIVE NOTE: Final rept.,

48P

PERSONAL AUTHORS: Eisenthal, Kenneth B.

OCT 86 195P

CONTRACT NO. AFOSR-84-0013

PERSONAL AUTHORS: Robinson,

PROJECT NO. 2303

CONTRACT NO. AFOSR-87-0046

TASK NO. B2

PROJECT NO. 2304

MONITOR: AFOSR

TASK NO. A6

TR-88-0283

MONITOR: AFOSR  
TR-88-0287

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The completed research was directed at fundamental investigations of ultra fast chemical reactions, the generation and decay of reactive chemical intermediates, as well as the role of the solvent and molecular motions on chemical dynamics. The construction of an amplified CPM laser enabled the opportunity to probe chemical events occurring in the femtosecond time domain. The effects of molecular geometry, solvent and solute steric effects, on the chemical dynamics was explored. An important new component of the research was the studies of chemical phenomena on surfaces as well as in bulk media. The asymmetry of forces associated with liquid surfaces was found to impose new restraints and possibilities on the generation of chemical species; thus affecting the chemical species lifetimes, motions and pathways for reaction.

DESCRIPTORS: (U) \*PHOTOCHEMICAL REACTIONS, \*SOLVATION, \*LASER TARGET INTERACTIONS, CHEMICAL REACTIONS, DYNAMICS, LIQUIDS, MEDIA, MOLECULAR STRUCTURE, MOLECULES, MOTION, PROBES, RESTRAINT, SOLVENTS, SURFACES, TIME DOMAIN, QUICK REACTION, PULSED LASERS, LIGHT PULSES, CARBENES, PHENYL RADICALS, NITRILES, REACTION KINETICS.

IDENTIFIERS: (U) Nitrile/p-w, N-Dimethylanilino benzene, Second harmonic generation, Binaphthyl, Picosecond time, Carbene/Diphenyl, PE61102F, WUAFOSR230382.

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ABSTRACT: (U) There were 274 papers presented in a variety areas related to information theory including multiple-access channels, estimation decentralized detection, and coding theory, random processes, data compression, quantization, and speech and image processing.

DESCRIPTORS: (U) \*INFORMATION THEORY, \*SYMPOSIA, \*CODING, \*DATA PROCESSING, INTERNATIONAL, ESTIMATES, MULTIPLE ACCESS, DATA COMPRESSION, DETECTION, DECENTRALIZATION, DECODING, SPEECH RECOGNITION, IMAGE PROCESSING, OPTICAL COMMUNICATIONS, PATTERN RECOGNITION, QUEUEING THEORY, ARRAYS, INTEGRATED CIRCUITS, MAGNETIC RECORDING SYSTEMS, CONVOLUTION, SEQUENCES, ALGORITHMS, INFORMATION PROCESSING, ABSTRACTS.

IDENTIFIERS: (U) Coding theory, Quantization, Systolic arrays, VLSI arrays, Random access communications, Shannon theory, Trellis codes, Multiple access channels, Filtering, PE61102F, WUAFOSR2304A6.

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## BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

## BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Computer Simulation of Neural Networks for Perceptual Psychology.

(U) Speech Perception and Production by a Self-Organizing Neural Network.

DESCRIPTIVE NOTE: Interim rept..

DESCRIPTIVE NOTE: Interim rept..

86 8P

DEC 87 17P

PERSONAL AUTHORS: Grossberg, Stephen; Mingolla, Ennio

PERSONAL AUTHORS: Cohen, Michael A.; Grossberg, Stephen; Stork, David G.

CONTRACT NO. F49620-86-C-0037, DAAG29-85-K-0095

CONTRACT NO. F49620-86-C-0037, F49620-87-C-0018

PROJECT NO. 2313

PROJECT NO. 2313

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR

TR-88-0378

MONITOR: AFOSR  
TR-88-0353

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Behavior Research Methods, Instruments, & Computers, v18 n6 p601-607 1986.

SUPPLEMENTARY NOTE: Prepared in cooperation with Clark Univ., Worcester, MA. Department of Physics and Program in Neuroscience.

ABSTRACT: (U) Computer simulations of neural network processes fill an important methodological niche, permitting the investigation of questions not resolvable by physiological, behavioral, or formal approaches alone. Two types of network simulations are considered: simulations of boundary completion and simulations of segmentation. Simulations that compare properties of published models with variations of these models are presented to illustrate how parametric computer simulations have guided the development of neural models of visual perception.

ABSTRACT: (U) Considerations of the real-time self-organization of neural networks for speech recognition and production have lead to a new understanding of several key issues in such networks, most notably a definition of new processing units and functions of hierarchical levels in the auditory system. An important function of a particular neural level in the auditory system is to provide a partially-compressed code, mapped to the articulatory system, to permit imitation of novel sounds. Furthermore, top-down priming signals from the articulatory system to the auditory system help to stabilize the emerging auditory code. These structures help explain results from the motor theory, which states the speech is analyzed by how it would be produced. Higher stages of processing require chunking or unitization of the emerging language code, an example of a classical grouping problem. The partially compressed auditory codes are further compressed into iter codes (e.g., phonemic segments), which are stored in a working memory representation whose short-term memory pattern is its code. A masking field level receives input from this

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*VISUAL PERCEPTION, BOUNDARIES, MODELS, NERVOUS SYSTEM, NETWORKS, NEURAL NETS, PERCEPTION, PSYCHOLOGY, REPRINTS, SEGMENTED, SIMULATION, BEHAVIOR, NETWORKS.

IDENTIFIERS: (U) WUAFOSR2313A5, PEB1102F.

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working memory and encodes this input into list chunks, whose top-down signals organize the items in working memory into coherent groupings with invariant properties. This total architecture sheds new light on key speech issues such as coarticulation, analysis-by-synthesis, motor theory, categorical perception, invariant speech perception, word superiority, and phonemic restoration.

DESCRIPTORS: (U) \*NEURAL NETS, \*PROCESSING EQUIPMENT, \*SELF ORGANIZING SYSTEMS, \*SPEECH RECOGNITION, ARCHITECTURE, AUDITORY PERCEPTION, CODING, COMPRESSION, HEARING, HIERARCHIES, INVARIANCE, LANGUAGE, MASKING, MEMORY DEVICES, MOTORS, NERVOUS SYSTEM, PATTERNS, PERCEPTION, PRIMERS, PROCESSING, PRODUCTION, REAL TIME, SIGNALS, SPEECH, THEORY.

IDENTIFIERS: (U) PE01102F, WUAF0SR2313A5.

BOSTON UNIV MA CENTER FOR ADAPTIVE SYSTEMS

(U) Predictive Regulation of Associative Learning in a Neural Network by Reinforcement and Attentive Feedback.

DESCRIPTIVE NOTE: Interim rept..

DEC 87 41P

PERSONAL AUTHORS: Grossberg, Stephen; Levine, Daniel; Schmajuk, Nestor

CONTRACT NO. F49620-88-C-0037, F49620-88-C-0018

PROJECT NO. 2313

TASK NO. A5

MONITOR: AFOSR  
TR-88-0373

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Texas Univ., Arlington, TX. Department of Mathematics.

ABSTRACT: (U) A real time neural network model is described in which reinforcement helps to focus attention upon and organize learning of those environmental events and contingencies that have predicted behavioral success in the past. Computer simulations of the model reproduce properties of attentional blocking, inverted-U in learning as a function of interstimulus interval, primary and secondary excitatory and inhibitory conditioning, anticipatory condition-responses, attentional focussing by conditioned motivational feedback, and limited capacity short term memory processing. Qualitative explanations are offered of why conditioned responses extinguish when a conditioned excitator is presented alone, but do not extinguish when a conditioned inhibitor is presented alone. These explanations invoke associative learning between sensory representations and drive, or emotional, representations (in the form of conditioned reinforcer and incentive motivational learning), between sensory representations and learned expectations of future sensory events, and between sensory representations and learned motor commands. Drive representations are organized in opponent positive and

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negative pairs (e.g., fear and relief), linked together by recurrent gated dipole, or READ, circuits. Cognitive modulation of conditioning is regulated by adaptive resonance theory, or ART, circuits which control the learning and matching of expectations, and the match-contingent reset of sensory short term memory. Dendritic spines are invoked to dissociate read-in and read-out of associative learning and to thereby design a memory which does not passively decay, does not saturate, and can be actively extinguished by opponent interactions.

DESCRIPTORS: (U) \*ASSOCIATIVE PROCESSING, \*COMPUTERIZED SIMULATION, \*LEARNING, \*NEURAL NETS, \*ATTENTION, ADAPTIVE SYSTEMS, DENDRITIC STRUCTURE, DRIVES, ENVIRONMENTS, FEEDBACK, INHIBITORS, MOTIVATION, READ OUT TECHNIQUES, RESONANCE, RESPONSE, SENSES(PHYSIOLOGY), SPINAL COLUMN, THEORY, MEMORY DEVICES, COGNITION, INFORMATION PROCESSING.

IDENTIFIERS: (U) WUAFOSR2313A5, PE61102F.

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11/8.1 11/8.2

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF MATERIALS SCIENCE

(U) Processing and Properties of Advanced Aluminum Alloys.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 87,

FEB 88

PERSONAL AUTHORS: Wert, John A.; Starke, Edgar A., Jr

REPORT NO. UVA/525870/MS88/101

CONTRACT NO. AFOSR-87-0082

MONITOR: AFOSR  
TR-88-0285

UNCLASSIFIED REPORT

ABSTRACT: (U) This project has as its focus microstructure control and fracture of advanced aluminum alloys. Our progress report is divided into two major parts: Part I which is concerned with the effect of microstructure on the deformation and fracture of advanced aluminum alloys, and Part II which is concerned with the recovery and recrystallization mechanisms that operate during processing of advanced aluminum alloys. Age hardenable aluminum alloys may undergo relatively brittle intergranular fracture at strains from 2 to 10 times smaller than the strain to fracture for pure aluminum. This phenomenon can be explained in broad terms as follows. Within a grain, an advancing dislocation either bypasses the coherent particles it encounters or cuts through them; cutting reduces the effective size of the obstacle, while bypassing the obstacle effectively enlarges it. If the obstacles are cut, the weakened plane will continue to slip and deformation will be localized. As a result, dislocations pile up at the grain boundaries at isolated points; the large associated tensions across the grain boundaries open intergranular cracks which propagate without absorbing much energy.

DESCRIPTORS: (U) \*ALUMINUM ALLOYS, \*FRACTURE(MECHANICS), \*MICROSTRUCTURE, ALUMINUM, BRITTLENESS, COHERENCE, DISLOCATIONS, DEFORMATION, GRAIN BOUNDARIES, PARTICLES, PURITY, RECRYSTALLIZATION, SUBJECT INDEXING, STRAIN RATE, CRACK PROPAGATION, AGE HARDENING, STRAIN(MECHANICS), DUCTILITY, MANGANESE, RECOVERY, ANNEALING.

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GEORGIA INST OF TECH ATLANTA SCHOOL OF MATERIALS  
ENGINEERING

IDENTIFIERS: (U) Aluminum alloy-2134, Fracture toughness,  
Dispersoids, Superplasticity.

(U) Effect of Microstructure on the Fatigue Crack  
Propagation Behavior of Ni-Base Superalloys.

IAC NO. MCIC-134035

DESCRIPTIVE NOTE: Technical rept. 1 May 84-30 Sep 87.

IAC DOCUMENT TYPE: MCIC - HARD COPY --

IAC SUBJECT TERMS: M--(U)COUNTRY USA, ALUMINUM ALLOYS,  
AGE HARDENING, INTERGRANULAR FRACTURE, BRITTLE FRACTURE,  
MICROSTRUCTURE, DUCTILE FRACTURE, MANGANESE ADDITION,  
2134, PARTICLE SIZE, SLIP, MATHEMATICAL MODELS, GRAIN  
SIZE, VOLUME FRACTION, PLATE, HOT ROLLING, UNDERAGING,  
OVERAGING, VOIDS, RECRYSTALLIZATION, ANNEALING,  
DEFORMATION, ZIRCONIUM ADDITION, CARBON ADDITION, TRUE  
STRESS-TRUE STRAIN.;

DEC 87

PERSONAL AUTHORS: Antolovich, Stephen D.

CONTRACT NO. AFOSR-84-0101

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-88-0285

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this study is to determine the effect of microstructural properties on the fatigue crack propagation (FCP) response of nickel-base superalloys. This report describes the results of four experimental alloys containing various amounts of Al, Ti, Cr, and Mo. Chemistry, precipitate size, and grain size were varied to produce systematically controlled microstructures. The four alloys were characterized for chemical composition, microstructure, tensile properties, low cycle fatigue (LCF), and FCP resistance. The FCP tests were performed under constant load (increasing K) conditions in air at a stress ratio (R) of 0.1 and 0.8. Closure loads were measured with a clip gage, back-face strain gage, and a laser extensometer. Keywords: Fatigue crack propagation, Ni-base superalloys, Microstructure, Closure, Mismatch, Anti-phase boundary, Aluminum, Titanium, Chromium, Molybdenum.

DESCRIPTORS: (U) \*CRACK PROPAGATION, \*FATIGUE(MECHANICS), \*NICKEL ALLOYS, \*SUPERALLOYS, \*TENSILE PROPERTIES, CHEMICAL COMPOSITION, CONSTANTS, CONTROL, CRACKING(FRACTURING), CYCLES, EXTENSOMETERS, FATIGUE, GRAIN SIZE, LASERS, LOADS(FORCES), MICROSTRUCTURE, PRECIPITATES, RATIOS, RESPONSE, SIZES(DIMENSIONS), STRAIN GAGES, STRESSES, ALUMINUM ALLOYS, CHROMIUM ALLOYS.

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MOLYBDENUM ALLOYS, TITANIUM ALLOYS.

NORTHWESTERN UNIV EVANSTON IL DEPT OF CIVIL ENGINEERING

IDENTIFIERS: (U) WUAFOSR2308A1, PE61102F.

(U) Adaptive Finite Element Methods for Shells.

IAC NO. MCIC-134000

DESCRIPTIVE NOTE: Final rept. 1 Sep 85-31 Dec 87.

IAC DOCUMENT TYPE: MCIC - HARD COPY --

JAN 88 127P

IAC SUBJECT TERMS: M--(U)COUNTRY USA, LOW CYCLE FATIGUE, NICKEL ALLOYS, AIR, MICROSTRUCTURE, STRESS INTENSITY, TEMP 0 TO 99 C, GAMMA PRIME, STRESS STRAIN DATA, LATTICE STRUCTURE, FLOW STRESS, TRANSMISSION MICROSCOPY, TRUE STRESS-TRUE STRAIN, FATIGUE CRACK GROWTH RATE, DA/DN, ALUMINUM ADDITION, TITANIUM ADDITION, CHROMIUM ADDITION, NI-10CR, NI-14CR, NI-13CR, CRACK CLOSURE, PHASE STUDIES.;

PERSONAL AUTHORS: Belytschko, Ted; Liu, Wing K.; Chang, Hsiu-Guo

CONTRACT NO. F49820-85-C-0128

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-88-0277

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) An adaptive finite element procedure is developed for the transient analysis of nonlinear shells. The scheme is an h-method which employs fission and fusion. Criteria based on incremental work and deviation of the bilinear finite element approximation to the shell from a Kirchhoff-Love surface are used as criteria for adaptivity. The example problems show that the adaptive schemes are capable of achieving substantial improvements in accuracy for a given computational effort. They include both material and geometric nonlinearities and local and global buckling. In order to formulate an r-adaptive method, the conservation laws, the constitutive equations, and the equation of state for path-dependent materials are formulated for an arbitrary Lagrangian-Eulerian description. Both geometrical and material nonlinearities are included in this setting. **Keywords:** Finite elements, Adaptive meshes, Shells.

**DESCRIPTORS:** (U) \*FINITE ELEMENT ANALYSIS.

\*SHELLS(STRUCTURAL FORMS). \*TRANSIENTS, ACCURACY, ADAPTATION, ADAPTIVE SYSTEMS, BUCKLING, CONSERVATION, EQUATIONS, EQUATIONS OF STATE, FISSION, GEOMETRY, GLOBAL, MESH, NONLINEAR SYSTEMS.

**IDENTIFIERS:** (U) WUAFOSR2302B1, PE61102F.

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CALIFORNIA UNIV RIVERSIDE DEPT OF STATISTICS

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) Measuring Dispersion Effects of Factors in Factorial Experiments.

(U) The Computation of Stationary Distributions on Markov Chains through Perturbations.

DESCRIPTIVE NOTE: Technical rept.,

DESCRIPTIVE NOTE: Technical rept. Sep 87-Aug 88,

JAN 88 29P

MAR 88 23P

PERSONAL AUTHORS: Ghosh, Subir; Lagergren, Eric S.

PERSONAL AUTHORS: Hunter, Jeffrey J.

REPORT NO. TR-159

REPORT NO. TR-227

CONTRACT NO. AFOSR-87-0043

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR  
TR-88-0493MONITOR: AFOSR  
TR-88-0398

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This paper is an attempt to understand and measure dispersion effects of factors in factorial experiments. The simplest setting is considered in order to develop better comprehension and insight. The properties of the proposed descriptive measures are examined. A method of adjusting residuals and its use in measuring dispersion effects are discussed. Illustrative examples are also given. The problem considered in this paper arises in quality control studies and the methodologies are applicable to industrial experiments. Keywords: Adjusted residuals; Design; Dispersion effects; Linear models; Quality control.

ABSTRACT: (U) An algorithmic procedure, for the determination of the stationary distribution of a finite, m-state, irreducible Markov chain, that does not require the use of methods for solving systems of linear equations, is presented. The technique is based upon a succession of m, rank one, perturbations of the trivial doubly stochastic matrix whose known steady state vector is updated at each stage to yield the required stationary probability vector.

DESCRIPTORS: (U) \*COMBINATORIAL ANALYSIS, \*QUALITY CONTROL, COMPREHENSION, DISPERSING, LINEARITY, MATHEMATICAL MODELS, MEASUREMENT, RESIDUALS.

DESCRIPTORS: (U) \*MARKOV PROCESSES, \*LINEAR ALGEBRA, ALGORITHMS, LINEAR ALGEBRAIC EQUATIONS, PERTURBATIONS, PROBABILITY, STATIONARY, STEADY STATE, STATISTICAL DISTRIBUTIONS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5.

IDENTIFIERS: (U) \*Markov chains, PE61102F, WUAFOSR2304A5.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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TEXAS UNIV AT AUSTIN DEPT OF AEROSPACE ENGINEERING AND  
ENGINEERING MECHANICS(U) Physical Mechanisms in Shock-Induced Turbulent  
Separated Flow.

DESCRIPTIVE NOTE: Annual rept. 1 Mar 86-30 Nov 87.

DEC 87 45P

PERSONAL AUTHORS: Dolling, D. S.

CONTRACT NO. AFOSR-88-0112

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-88-0292

## UNCLASSIFIED REPORT

ABSTRACT: (U) It has been demonstrated that the flow downstream of the moving shock is separated and that the foot of the shock is effectively the instantaneous separation point. The shock induced turbulent separation is an intermittent process and the separation line indicated by surface tracer methods, such as kerosene-lampblack, is a downstream boundary of a region of intermittent separation. Keywords: Shock induced separation, Turbulent boundary layers, Reattachment.

DESCRIPTORS: (U) \*SHOCK, \*TURBULENT BOUNDARY LAYER, \*FLOW SEPARATION, BOUNDARIES, DOWNSTREAM FLOW, MOTION, PHYSICAL PROPERTIES, REGIONS, TURBULENCE, ATTACHMENT.

IDENTIFIERS: (U) WUAFOSR2307A, PE61102F.

AD-A193 155 7/4

FLORIDA UNIV GAINESVILLE DEPT OF CHEMISTRY

(U) Quenching of Na Resonance Radiation; Collisions of  
Excited Sodium with Atoms, Molecules and Electrons in  
the ICP (Inductively Coupled Plasma).

87 13P

PERSONAL AUTHORS: Hasegawa, T.; Smith, B.; Winefordner, J.  
D.

CONTRACT NO. AFOSR-88-0015

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-88-0109

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Spectrochimica, V428 n10  
p1093-1104 1987.

ABSTRACT: (U) Spatial distributions of Na resonance level lifetimes in the inductively coupled plasma (ICP) are measured by time-resolved laser-excited fluorimetry. In order to elucidate the quenching mechanism, the lifetimes obtained are compared to theoretical values estimated from the quenching rate coefficients and number densities of colliding species. As a result, it is shown that resonance level Na atoms are mainly deactivated by electrons at lower heights in the plasma, while collisions with nitrogen molecules entrained from the surrounding atmosphere dominated the quenching reaction in the tail flame region. Keywords: Quenching, Laser excitation, Time resolution, Lifetime.

DESCRIPTORS: (U) \*COUPLING(INTERACTION), \*PLASMAS(PHYSICS), \*QUENCHING, ATOMS, COEFFICIENTS, COLLISIONS, DENSITY, ELECTRONS, EXCITATION, FLAMES, FLUORIMETERS, LASER BEAMS, LASERS, LIFE SPAN(BIOLOGY), MOLECULES, NITROGEN, QUENCHING(INHIBITION), RATES, REGIONS, RESOLUTION, RESONANCE, RESONANCE RADIATION, RESPONSE, SODIUM, SPATIAL DISTRIBUTION, TAIL ASSEMBLIES, TIME, VALUE, REPRINTS.

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IDENTIFIERS: (U) PE81102F, WUAFOSR2303A1.

FLORIDA UNIV GAINESVILLE DEPT OF CHEMISTRY

(U) Spatial Diagnostics in Inhomogeneous Flames with a Copper Vapor Laser System: Absorption, Two-Wavelength Fluorescence and Two-Wavelength Ionization,

87 10P

PERSONAL AUTHORS: Rutledge, M. T.; Mawn, M.; Smith, B.; Winefordner, J. D.

CONTRACT NO. AFOSR-88-0015

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-88-0347

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Applied Spectroscopy, V41 n8 p1388-1404 1987.

ABSTRACT: (U) Two-wavelength laser-excited fluorescence and laser-enhanced ionization are investigated for use with spatial profiling applications. A recently introduced absorption technique (which involves measuring the differential absorption of a probe beam with a pump beam on and off) is also investigated for use with spatial profiling applications and determination of absolute number densities. A high-repetition-rate, high-average-power copper vapor laser with a computer-controlled data acquisition and beam scanning system was used for speed, repeatability, and ease of data collection. Keywords: Copper vapor laser, Flames, Spatial diagnostics, Fluorescence, Ionization.

DESCRIPTORS: (U) \*FLAMES, \*LASER INDUCED FLUORESCENCE, \*LASERS, \*METAL VAPORS, \*PUMPING(ELECTRONICS), COMPUTER APPLICATIONS, CONTROL, COPPER, DATA ACQUISITION, DENSITY, DIAGNOSIS(GENERAL), FLUORESCENCE, IONIZATION, PROBES, SCANNERS, SPATIAL DISTRIBUTION, RADIATION ABSORPTION, REPRINTS.

IDENTIFIERS: (U) Metal vapor lasers, \*Copper vapor lasers, PE81102F, WUAFOSR2303A1.

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EV148A

AD-A193 123

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STANFORD UNIV CA DEPT OF APPLIED PHYSICS

(U) Superconducting Thin Films, Composites and Junctions.

DESCRIPTIVE NOTE: Final rept. 1 May 87-31 Oct 87.

NOV 87

9P

PERSONAL AUTHORS: Geballe, T. H.

CONTRACT NO. F49620-82-C-0014

PROJECT NO. 2308

TASK NO. C1

MONITOR: AFOSR  
TR-88-0307

UNCLASSIFIED REPORT

**ABSTRACT:** (U) The successful synthesis of high-Tc YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> films by means of electron beam codeposition has been accomplished. Several important growth parameters have been surveyed in a preliminary way. The substrates investigated include Al<sub>2</sub>O<sub>3</sub>, ZrO<sub>2</sub>, MgO and SrTiO<sub>3</sub>. The films were characterized by resistivity measurements, X-ray diffraction, microprobe, and Rutherford backscattering analysis. Some TEM and critical current density studies were also carried out. The best results to date have been obtained on SrTiO<sub>3</sub> substrates with which polycrystalline epitaxial growth has been achieved. Resistive superconducting transitions with zero resistance at 89.5K and a 2K width have been observed in these films. **Keywords:** Thin films; Superconductivity; Vapor deposition; Single crystal films; Small scale Calorimetry, Structures, Metastable phases, Oxides.

**DESCRIPTORS:** (U) \*SUPERCONDUCTIVITY, \*SUPERCONDUCTORS, \*THIN FILMS, BACKSCATTERING, CALORIMETRY, CURRENT DENSITY, DEPOSITION, ELECTRON BEAMS, EPITAXIAL GROWTH, MEASUREMENT, METASTABLE STATE, OXIDES, PARAMETERS, POLYCRYSTALLINE, SINGLE CRYSTALS, SUBSTRATES, TRANSITIONS, VAPOR DEPOSITION, X RAY DIFFRACTION, ELECTRICAL RESISTANCE, YTTRIUM, BARIUM, COPPER COMPOUNDS, OXIDES, TITANIUM OXIDES, STRONTIUM, PEROVSKITES.

IDENTIFIERS: (U) PE81102F, WJAFOSR2306C1.

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20/5

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Trajectory Study of the Formation and Decay of Silicon Trimer Complexes in Monomer-Dimer Collisions.

MAR 88

10P

PERSONAL AUTHORS: Gal, Huadong; Thompson, Donald L.; Raff, Lionel M.

CONTRACT NO. AFOSR-88-0043

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-88-0310

UNCLASSIFIED REPORT

**SUPPLEMENTARY NOTE:** Pub. in The Jnl. of Chemical Physics v88 n1 p158-162, 1 Jan 88.

**ABSTRACT:** (U) The dynamics of the formation and dissociation of Si<sub>3</sub> complexes in atom-dimer collisions have been investigated using quasiclassical trajectories on a potential-energy surface that is a global fit to the available experimental data and ab initio CI and MP4 results. The fitted surface yields excellent results for the equilibrium geometries of both Si<sub>2</sub> and Si<sub>3</sub>. The rms deviation of the energies from the MP4 calculations is 0.117 eV. The Si<sub>3</sub> fundamental frequencies agree with the MP4 results to within 37/cm or less. Formation cross sections for Si<sub>3</sub> formation are reported as a function of initial relative translational energy. These cross sections are found to exhibit a near double exponential dependence upon relative translational energy. **Keyword:** Silicon.

**DESCRIPTORS:** (U) \*SILICON, \*MOLECULAR COMPLEXES, CROSS SECTIONS, DYNAMICS, ENERGY TRANSFER, EQUILIBRIUM(GENERAL), EXPERIMENTAL DATA, SURFACES, TRAJECTORIES, CHEMICAL DISSOCIATION, ATOMS, COLLISIONS, REACTION KINETICS, RECOMBINATION REACTIONS, DECAY, POTENTIAL ENERGY, MONOMERS, DIMERS, REPRESENTS.

IDENTIFIERS: (U) \*Trimers, \*Atom molecule interactions.

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DYIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

AD-A193 121 CONTINUED  
PE61102F, WUAFOSR2303B3.

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PRINCETON UNIV NJ DEPT OF CHEMICAL ENGINEERING

(U) Reactions of Pyrrole with Ni(100).

87 11P

PERSONAL AUTHORS: Schoor's, Gregory R.; Benziger, Jay B.

CONTRACT NO. AFOSR-88-0050

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-88-0312

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science, v192 p373-382 1987.

ABSTRACT: (U) The reactions of pyrrole with a clean Ni(100) surface have been studied with temperature programmed reaction (TPR), reflection absorption infrared spectroscopy (RAIS), and Auger electron spectroscopy (AES). RAIS indicated that pyrrole adsorbs on clean Ni(100) at 200 K with its ring parallel to the surface, presumably via pi-bonding with the 1 A2 orbital. During TPR experiments with a heating rate of 8 K/s, pyrrole desorbs molecularly at 235 K and dihydrogen evolves above room temperature, in accord with equilibrium thermodynamics. During TPR experiments with a heating rate of 45 K/s, new pathways emerge. Light gases, principally HCN, H2, and NH3, desorb at circa 570 K. The variation of pyrrole decomposition products with slightly different heating rates suggests a change from a decomposition reaction to a polymerization reaction with increasing heating rates. Keywords: Pyrrole, Nickel, Surface polymerization, Reprints.

DESCRIPTORS: (U) \*NICKEL, \*PYRROLES, ABSORPTION, AUGER ELECTRON SPECTROSCOPY, COMPUTER PROGRAMMING, DECOMPOSITION, EQUILIBRIUM(GENERAL), HEATING, POLYMERIZATION, RATES, REFLECTION, REPRINTS, RESPONSE, ROOM TEMPERATURE, SPECTROSCOPY, SURFACES, TEMPERATURE, THERMODYNAMICS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EV148A

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IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2.

OHIO STATE UNIV RESEARCH FOUNDATION COLUMBUS

(U) Distributed Knowledge Base Systems for Diagnosis and Information Retrieval.

DESCRIPTIVE NOTE: Technical rept..

APR 88 180P

PERSONAL AUTHORS: Chandrasekaran, B.

CONTRACT NO. AFOSR-87-0090

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-88-0572

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes work done in artificial intelligence. Research is reported on in the following areas: applications of generic task methodology to learning, design, and planning; theoretical and critical studies of connectionism, neural nets, and symbolic computation; and studies of the uses of distributed systems for concurrent algorithms/implementation for abductive assembly a basic generic problem solving task. Topics include: A corrective learning procedure using different explanatory types; A task oriented approach to knowledge-based systems for process engineering design; An information processing model of Japanese foreign and energy policy decision making; Understanding device feedback; Connectionism and information processing abstractions--The message still counts more than the medium; Some experiments with neural nets; From numbers to symbols to knowledge structures--AI perspectives on the classification task; Distributed synthesis of composite explanatory hypotheses.

DESCRIPTORS: (U) \*ARTIFICIAL INTELLIGENCE, \*INFORMATION RETRIEVAL, CLASSIFICATION, COMPUTATION, DISTRIBUTION, ENGINEERING, HYPOTHESES, INFORMATION PROCESSING, LEARNING, METHODOLOGY, MODELS, NEURAL NETS, PROBLEM SOLVING, PROCESSING, SYMBOLS, SYNTHESIS, DECISION MAKING, ALGORITHMS.

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI46A

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AD-A193 078 5/8 8/4

IDENTIFIERS: (U) LPN-OSURF-798799, LPN-OSURF-719026,  
PE81102F, WJAFOSR2304A7.

NORTHWESTERN UNIV EVANSTON IL CRESAP NEUROSCIENCE LAB

(U) Perception of Motion in Statistically-Defined Displays.

DESCRIPTIVE NOTE: Annual scientific rept. 1 Oct 86-30 Sep 87.

FEB 88 102P

PERSONAL AUTHORS: Sekuler, Robert

CONTRACT NO. AFOSR-85-0370

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-88-0288

UNCLASSIFIED REPORT

ABSTRACT: (U) Though motion perception does depend upon spatially local processes, under certain circumstances global processes make an important contribution. For example, the human visual system can integrate different, spatially-intermingled motion vectors into a global percept of motion in a single direction. Such integrated percepts may offer important clues to the mechanisms of motion perception. To exploit such clues we have followed the tradition of using psychophysical mechanisms. Specifically, we were interested in how easily observers could discriminate between two different global motions when each had resulted from the integration of many different motion vectors. Our stimuli were random dot cinematograms in which each dot took an independent two-dimensional random walk with steps of constant size. The direction any dot moved, from one display frame to the next, was independent of the dot's previous movements as well as the movements of other dots. All dots chose their directions of movement from the same probability distribution.

DESCRIPTORS: (U) \*MOTION, \*SPATIAL DISTRIBUTION, \*VISUAL PERCEPTION, \*SPACE PERCEPTION, DISCRIMINATION, FRAMES, GLOBAL, HUMANS, ORIENTATION(DIRECTION), PERCEPTION, PROBABILITY DISTRIBUTION FUNCTIONS, PROBES, PSYCHOPHYSICS,

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A193 084 20/13 20/4

SIZES(DIMENSIONS), STIMULI, VISION, MATHEMATICAL MODELS, COMPUTATIONS, STATISTICAL DISTRIBUTIONS, TWO DIMENSIONAL, DISPLAY SYSTEMS.

STANFORD UNIV CA DEPT OF MECHANICAL ENGINEERING  
(U) The Heat Transfer and Fluid Dynamics of Concave Surface Curvature.

IDENTIFIERS: (U) \*Motion perception, PE81102F.  
WUAFOSR2312A5.

DESCRIPTIVE NOTE: Annual rept. 1 Jan-31 Dec 87.

MAR 88 12P

PERSONAL AUTHORS: Johnston, J. P.; Moffat, R. J.

CONTRACT NO. AFOSR-88-0073

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR  
TR-88-0503

UNCLASSIFIED REPORT

ABSTRACT: (U) The overall goal of this project is study convective heat transfer and fluid-mechanics in a concavely curved turbulent boundary layer. The objective is to identify the mechanisms whereby concavity increases surface heat transfer. Progress during the past year has centered on the recently added goal of studying the combined effects of moderate levels of grid-generated turbulence and concave curvature. Overall results from the fluid-mechanics section of the project are that grid-generated turbulence increases the skin friction, but does not alter the near-wall mean velocity scaling or the near-wall levels of the velocity fluctuations. The heat transfer measurements are showing that the Stanton number is increased by the grid-generated turbulence with the combined effects of curvature and the additional turbulence producing the largest increase. Keywords: heat transfer, Turbulent boundary layers, Adaptive grids.

DESCRIPTORS: (U) \*CONVECTION(HEAT TRANSFER), \*CURVATURE, \*TURBULENT BOUNDARY LAYER, \*BOUNDARY LAYER FLOW, ADAPTIVE SYSTEMS, CONCAVE BODIES, FLUID DYNAMICS, GRIDS, HEAT TRANSFER, MEASUREMENT, SKIN FRICTION, SURFACES, TURBULENCE, VARIATIONS, VELOCITY.

IDENTIFIERS: (U) Stanton number, PE81102F, WUAFOSR2307A4.

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SEARCH CONTROL NO. EVI46A

AD-A193 083 20/4

WASHINGTON UNIV SEATTLE DEPT OF AERONAUTICS AND  
ASTRONAUTICS

(U) Turbulence Structure of Mixing Swirling Flows.

DESCRIPTIVE NOTE: Annual Rept. 1 Oct 86-30 Sep 87.

DEC 87 7P

PERSONAL AUTHORS: Gessner, Frederick B.

CONTRACT NO. AFOSR-85-0273

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-88-0488

UNCLASSIFIED REPORT

ABSTRACT: (U) Modifications to the swirling jet flow facility and mean flow data taken in the initial mixing region are described. Measurements are made at six streamwise locations downstream of the nozzle exit for three different initial mass flow rate ratios. The data were analyzed in order to calculate static pressure profiles, total and component velocity profiles, and local wall shear stress values. The results show that an axially-directed outer stream inhibits the spreading rate of the swirling inner stream and the decay of the swirl within that stream. The results also show that near-wall similarity exists in flow near the centerbody, so that the two dimensional form of the law-of-the-wall, when applied to the total velocity, can serve as a valid wall function for prediction purposes. Keywords: Turbulent jets, Mixing, Turbulence structure.

DESCRIPTORS: (U) \*JET FLOW, \*TURBULENT FLOW, EXITS, FLOW RATE, MASS FLOW, MEAN, MIXING, NOZZLES, PROFILES, RATIOS, REGIONS, STATIC PRESSURE, STREAMS, TURBULENCE, VELOCITY, WALLS, SHEAR STRESSES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2307A2.

AD-A193 083

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AD-A193 082 7/2

SAN DIEGO STATE UNIV CA DEPT OF CHEMISTRY

(U) The Chemistry of Precursors to Silicon Carbide.

DESCRIPTIVE NOTE: Final Rept.,

MAR 88 9P

PERSONAL AUTHORS: Ring, W. A.; O'Neal, H. E.

CONTRACT NO. AFOSR-83-0208

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-88-0520

UNCLASSIFIED REPORT

ABSTRACT: (U) The research can be divided into 4 main areas: 1) Mechanisms and Kinetics of the Decompositions of Silane and Organosubstituted Monosilanes, and of Disilane and Organosubstituted Disilanes. 2) Relative Rate Kinetics of the Trapping Reactions of SiH2 with Ethylene, Acetylene, Butadiene, Methanol, Silane and 1-butene. 3) Mechanisms and Kinetics of the Isomerizations and Decompositions of Organosilylenes. 4) From the above studies, we were able to propose a general reaction mechanism for carbosilane production from the decomposition of dimethylsilane. Keywords: Silane, Organosubstituted Mono and Disilanes, Silylene, Organosubstituted silylenes.

DESCRIPTORS: (U) \*SILICON CARBIDES, ACETYLENE, CARBINOLS, CHEMISTRY, DECOMPOSITION, ETHYLENE, KINETICS, METHYL RADICALS, RATES, RESPONSE, SILANES.

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B2.

AD-A193 082

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

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AD-A193 080 12/3

NORTHEASTERN UNIV BOSTON MA

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) A Model for Visual Attention.

(U) A Unified Approach to Estimation in Linear Models with Fixed and Mixed Effects.

DESCRIPTIVE NOTE: Technical rept. Mar 87-Mar 88,

DESCRIPTIVE NOTE: Technical rept.,

APR 88 8P

NOV 87 19P

PERSONAL AUTHORS: Reeves, Adam

PERSONAL AUTHORS: Rao, C. R.

CONTRACT NO. AFOSR-87-0172

REPORT NO. TR-87-44

PROJECT NO. 2313

CONTRACT NO. N00014-85-K-0292, F49620-85-C-0008

TASK NO. A5

PROJECT NO. 2304

MONITOR: AFOSR  
TR-88-0485

TASK NO. A6

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-88-0388

ABSTRACT: (U) Research has been undertaken on visual attention and short term visual memory (VSTM). One set of experiments has concerned the role that depth information might play in retrieval from VSTM, using an iconic memory paradigm. Another set concerns development of the attention gating model, using the attention shift RSVP paradigm. Finally, we are studying some effects of attention and visual imagery on visual acuity.

DESCRIPTORS: (U) \*ATTENTION, \*MEMORY(PSYCHOLOGY), \*VISION, DEPTH, OPTICAL IMAGES, SHIFTING, VISUAL ACUITY, SPACE PERCEPTION.

IDENTIFIERS: (U) VSTM(Visual Short Term Memory), Depth perception, WUAFOSR2313A5, PE81102F.

AD-A193 061

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A6.

AD-A193 080

DESCRIPTORS: (U) \*LINEARITY, \*MATHEMATICAL MODELS, ALGEBRA, EQUATIONS, ERRORS, ESTIMATES, MEAN, OPTIMIZATION, PARAMETERS, PREDICTIONS, RANDOM VARIABLES.

UNCLASSIFIED REPORT

ABSTRACT: (U) A unified approach is developed for the estimation of unknown fixed parameters and prediction of random effects in a mixed Gauss-Markoff linear model. It is shown that both the estimators and their mean square errors can be expressed in terms of the elements of a g-inverse of a partitioned matrix which can be set up in terms of the matrices used in expressing the model. No assumptions are made on the ranks of the matrices involved. The method is parallel to the one developed by the author in the case of the fixed effects Gauss-Markoff model using a g-inverse of a partitioned matrix. A new concept of generalized normal equations is introduced for the simultaneous estimation of fixed parameters, random effects and random error. All the results are deduced from a general lemma on an optimization problem. This paper is self contained as all the algebraic results used are stated and proved. The unified theory developed in an earlier paper (Rao, 1988) is somewhat simplified.

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AD-A193 059 12/3

AD-A193 057 12/3

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) On Solvability of an Equation Arising in the Theory of M-Estimates.

(U) Statistical Analysis of Dyadic Stationary Processes.

DESCRIPTIVE NOTE: Technical rept.,

DESCRIPTIVE NOTE: Technical rept.,

NOV 87 18P

SEP 87 32P

PERSONAL AUTHORS: Bai, Z. D.; Chen, X. R.; Miao, B. Q.; Wu, Y. H.

PERSONAL AUTHORS: Taniguchi, M.; Zhao, L. C.; Krishnaiah, P. R.; Bai, Z. D.

REPORT NO. TR-87-48

REPORT NO. TR-87-40

CONTRACT NO. N00014-85-K-0292, F49620-85-C-0008

CONTRACT NO. N00014-85-K-0292, F49620-85-C-0008

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A6

TASK NO. A6

MONITOR: AFOSR TR-88-0400

MONITOR: AFOSR TR-88-0398

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This article, by obtaining the limit of probability that some equation arising in a case of M-estimate possesses at least one solution, establishes the fact that even in the simplest case, when the function rho is not differentiable at least at one point, it is not legitimate to convert a minimization problem defining the M-estimate to the solution of equations.

ABSTRACT: (U) There has been much discussion of Walsh spectral analysis for dyadic stationary processes. Morettin investigated some asymptotic properties of the finite Walsh transforms of dyadic stationary processes. Nagai gave the spectral representations for dyadic stationary processes. If we consider finite dyadic models then the greatest differences between dyadic stationary processes and ordinary stationary ones appear. Nagai and Nagai and Taniguchi established that a dyadic autoregressive and moving average process of finite order and also as a dyadic moving average process of finite order. Nagai and Taniguchi discussed the principal component analysis of a multiple dyadic process, and also the canonical correlation analysis. Morgettin gave a convenient survey for Walsh spectral analysis. This paper considers a multiple dyadic stationary process with a Walsh spectral density matrix.

DESCRIPTORS: (U) \*PROBABILITY DISTRIBUTION FUNCTIONS, EQUATIONS, PROBLEM SOLVING, MULTIVARIATE ANALYSIS, MATHEMATICAL MODELS, LINEARITY.

DESCRIPTORS: (U) \*STOCHASTIC PROCESSES, ASYMPTOTIC SERIES, WALSH TRANSFORMATION, STATIONARY, CORRELATION, LINEARITY, MATHEMATICAL MODELS, STATISTICAL PROCESSES, SPECTRUM ANALYSIS, MULTIVARIATE ANALYSIS.

IDENTIFIERS: (U) \*Dyadic Stationary processes, PE81102F,

AD-A193 059

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WJAFOSR2304A8.

AD-A193 036 20/12 7/5

MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF  
ELECTRONICS

(U) Femtosecond Dynamics of Highly Excited Carriers in  
Al<sub>x</sub>Ga(1-x)As.

JUL 87 4P

PERSONAL AUTHORS: Lin, W. Z.; Fujimoto, J. G.; Ippen, E.  
P.; Logan, R. A.

CONTRACT NO. AFOSR-85-0213

PROJECT NO. 2301

TASK NO. A1

MONITOR: AFOSR  
TR-88-0250

UNCLASSIFIED REPORT

Pub. in Applied Physics Letters, v51 n3 p161-163, 20 Jul  
87.

ABSTRACT: (U) Femtosecond transient absorption  
saturation measurements are used to investigate the  
scattering of optically excited carriers in AlGaAs. With  
pulses as short as 35 fs at 1.98 eV, scattering times  
ranging from 13 to 330 fs are observed in samples of  
Al<sub>x</sub>Ga<sub>1-x</sub>As with x=0, 0.1, 0.2, 0.3, and 0.4. A dramatic  
decrease in the rate of carrier scattering out of the  
initial optically excited states is observed with  
increasing Al concentration. (Gallium Arsenides)

DESCRIPTORS: (U) \*ALUMINUM GALLIUM ARSENIDE, \*ELECTRON  
SCATTERING, \*SEMICONDUCTORS, ABSORPTION, DYNAMICS,  
GALLIUM ARSENIDES, MEASUREMENT, SATURATION, TRANSIENTS,  
CHARGE CARRIERS, EXCITATION, DYE LASERS, SEMICONDUCTING  
FILMS, RELAXATION, ABSORPTION, DYNAMICS, GALLIUM  
ARSENIDES, MEASUREMENT, SATURATION, SCATTERING,  
TRANSIENTS, REPRINTS.

IDENTIFIERS: (U) PE81102F, WJAFOSR2301A1

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVI48A

AD-A193 024 12/8 17/7.3 17/5  
 CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF ELECTRICAL  
 AND COMPUTER ENGINEERING

AD-A193 014 21/2

GEORGIA INST OF TECH ATLANTA SCHOOL OF AEROSPACE  
 ENGINEERING

(U) Optical Data Processing.

(U) Heterogeneous Diffusion Flame Stabilization.

DESCRIPTIVE NOTE: Annual rept. Jan 87-Mar 88.

DESCRIPTIVE NOTE: Final rept. Oct 83-Sep 87.

APR 88 136P

NOV 87 12P

PERSONAL AUTHORS: Casasent, David

PERSONAL AUTHORS: Strahle, Warren C.; Jagoda, Jechiel I.

CONTRACT NO. AFOSR-84-0293

CONTRACT NO. AFOSR-83-0358

PROJECT NO. 2305

PROJECT NO. 2308

TASK NO. B1

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR

TR-88-0550

TR-88-0328

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This research concerns optical data processing for missile guidance and target recognition. It uses pattern recognition techniques with an increased use of knowledge base, inference machine and associative processor techniques. This work concerns new algorithms, real time and practical realizations of such systems, and new initial work on associative processors, symbolic rule-based processors and directed graph processors (with new attention to unique optical realizations of such systems).  
 Keywords: Optical data processing; Pattern recognition; Feature extraction; Associative processors; Symbolic processors; Rule based processors.

DESCRIPTORS: (U) \*GUIDANCE, \*GUIDED MISSILES, \*PATTERN RECOGNITION, \*TARGET RECOGNITION, \*OPTICAL PROCESSING, ALGORITHMS, ASSOCIATIVE PROCESSING, DATA PROCESSING, OPTICAL DATA, PROCESSING EQUIPMENT, REAL TIME, ALGORITHMS, HOLOGRAPHY, TELEVISION SYSTEMS, LIQUID CRYSTALS, VIDEO MAPPING.

IDENTIFIERS: (U) Feature extraction, Rule based processors, Symbolic processors, Hough transformations, PES1102F, WUAFOSR2305B1.

ABSTRACT: (U) Analytical modelling and several experimental diagnostics were applied to an experimental flow in a two-dimensional subsonic windtunnel with a backward facing step and provision for injection of inerts and combustibles through the porous floor behind the step. The analytical techniques were based on a two equation model of turbulence with several variants of near wall models and numerical approaches. Conventional experimental techniques, where applicable in the cold flow, included hot film and pitot anemometry. Laser based diagnostics in the cold and hot flows for velocity and species concentration measurements (both mean and instantaneous) included laser velocimetry in two components and Rayleigh molecular scattering.

DESCRIPTORS: (U) \*TURBULENT FLOW, ANEMOMETERS, COLD FLOW, DIAGNOSIS(GENERAL), DIFFUSION, EQUATIONS, EXPERIMENTAL DESIGN, FILMS, FLAMES, FLAMMABILITY, FLOORS, HETEROGENEITY, HIGH TEMPERATURE, LASER VELOCIMETERS, LASERS, MATHEMATICAL MODELS, METHODOLOGY, WIND TUNNEL, MODELS, MOLECULES, NUMERICAL METHODS AND PROCEDURES, PITOT TUBES, POROUS MATERIALS, RAYLEIGH SCATTERING, STABILIZATION, TURBULENCE, VARIATIONS, WALLS, SHEAR STRESSES, REACTION KINETICS, FUEL INJECTION, TWO DIMENSIONAL FLOW, FLOW FIELDS, RAMJET ENGINES, SOLID FUELS, SIMULATION.

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AD-A193 014 CONTINUED

AD-A193 013 12/5 12/6 12/1 11/4

IDENTIFIERS: (U) Mass transport, \*Hot flow, Backward facing steps, Reattachment, PE81102F, WUAFOSR2308A1.

DREXEL UNIV PHILADELPHIA PA DEPT OF MECHANICAL ENGINEERING AND MECHANICS

(U) Computation Equipment for Damage Simulation in Laminated Composites.

DESCRIPTIVE NOTE: Final rept. 1 Oct 86-30 Sep 87.

FEB 88 9P

PERSONAL AUTHORS: Wang, A. S.

REPORT NO. TR-5

CONTRACT NO. AFOSR-87-0013

PROJECT NO. 2302

TASK NO. 82

MONITOR: AFOSR  
TR-88-0311

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes the MicroVAX II based computational equipment funded by the Air Force Office of Scientific Research and installed at Drexel University. This equipment is dedicated exclusively for computational mechanics for composites materials research. Owing to its large computing capacity and availability to perform intensive computational tasks at substantially lower unit cost, this equipment has casted positive impacts on current AFOSR programs and other research work conducted at Drexel University. In short, this computational equipment has already enhanced the quality and the quantity of composite materials research at Drexel University. Keywords: Computational mechanics, Damage simulation, Composite materials.

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*COMPUTATIONS, \*LAMINATES, \*COMPUTER PROGRAMS, \*COMPUTERIZED SIMULATION, CAPACITY(QUANTITY), DAMAGE, LOW COSTS, MECHANICS, SIMULATION.

IDENTIFIERS: (U) PE81102F, WUAFOSR2308B2.

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AD-A193 013

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## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVI48A

AD-A193 012 11/4 20/11

AD-A193 011 12/4

WRIGHT STATE UNIV DAYTON OHIO

CALIFORNIA UNIV RIVERSIDE DEPT OF STATISTICS

(U) High Temperature Testing of C/C (Carbon/Carbon) Composites.

(U) Study on Various Problems in Statistical Planning and Inference.

DESCRIPTIVE NOTE: Final rept. Jul 86-Sep 87,

DESCRIPTIVE NOTE: Final rept. Dec 86-Nov 87,

DEC 87 8P

OCT 86 21P

PERSONAL AUTHORS: Dadras, Parvizi

PERSONAL AUTHORS: Ghosh, Subir

CONTRACT NO. AFOSR-86-0224

CONTRACT NO. AFOSR-86-0048

PROJECT NO. 2302

PROJECT NO. 2304

TASK NO. B2

TASK NO. A8

MONITOR: AFOSR  
TR-88-0308MONITOR: AFOSR  
TR-88-0308

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) A high temperature vacuum furnace for across-ply testing of carbon/carbon composites has been installed. This furnace has a double-walled water-jacketed vacuum chamber and is equipped with a 30 kVA variable output transformer, semi-automatic vacuum system, a digital temperature controller programmer, a two-color optical pyrometer, various thermocouples, and a digital data acquisition system. This furnace has been installed on an existing Model 1123 Instron and heating to 2200 C has been accomplished. Graphite toolings have been prepared and across-ply tensile testing to 1700 C have been conducted. Keywords: Carbon/carbon composites, High temperature, Graphite furnace, Across ply strength.

**DESCRIPTORS:** (U) \*CARBON CARBON COMPOSITES, \*THERMAL RESISTANCE, \*TENSILE STRENGTH, COLORS, DATA ACQUISITION, DIGITAL SYSTEMS, FURNACES, GRAPHITE, HIGH TEMPERATURE, HIGH VACUUM, OPTICAL PYROMETERS, OUTPUT, SEMIAUTOMATIC, TEST AND EVALUATION, THERMOCOUPLES, TRANSFORMERS, VACUUM APPARATUS, VARIABLES, TEST METHODS.

IDENTIFIERS: (U) PE81102F, WUAFOSR2302B2.

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**ABSTRACT:** (U) Two new measures were proposed to identify influential sets of observations at the design stage in view of prediction and fitting. Three measures of dispersion effects at different levels of factors in factorial experiments were introduced. Research continues on characterizing designs to enable one to measure and compare dispersion effects of levels of factors. Six papers were published and submitted for publication during this period.

**DESCRIPTORS:** (U) \*COMBINATORIAL ANALYSIS, DISPERSING, PLANNING, STATISTICS, STATISTICAL INFERENCE.

IDENTIFIERS: (U) PE81102, WUAFOSR2304A8.

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## DTIC REPORT BIBLIOGRAPHY

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AD-A193 008 7/4

WISCONSIN UNIV-MADISON

CALIFORNIA UNIV BERKELEY DEPT OF MECHANICAL ENGINEERING

(U) University - Instrumentation-Research-Program:  
Computer-Aided Study of Stochastic Processes in the  
Nervous System.

(U) Laser Spectroscopy of Plasmas.

DESCRIPTIVE NOTE: Annual rept. Dec 88-Dec 87.

DESCRIPTIVE NOTE: Final rept. 15 Dec 84-14 Dec 88.

FEB 88 13P

MAY 87 5P

PERSONAL AUTHORS: Daily, John W.

PERSONAL AUTHORS: Rhode, William S.

CONTRACT NO. AFOSR-88-0087

CONTRACT NO. AFOSR-85-0049

PROJECT NO. 2308

PROJECT NO. 2917

TASK NO. A3

TASK NO. A4

MONITOR: AFOSR  
TR-88-0299MONITOR: AFOSR  
TR-88-0302

UNCLASSIFIED REPORT

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ABSTRACT: (U) Research Projects pertained to: 1) Analysis of single and multiple Stochastic Point Processes; 2) Measurement of basilar and tectorial membrane vibration; 3) Studies on single auditory nerve fiber responses to speech sounds; 4) Models of the peripheral auditory system; and 5) Study of the pyramidal cortex.

DESCRIPTORS: (U) \*COMPUTER AIDED DIAGNOSIS, \*MEDICAL COMPUTER APPLICATIONS, HEARING, MEMBRANES, NERVOUS SYSTEM, SOUND, SPEECH, STOCHASTIC PROCESSES, VIBRATION.

IDENTIFIERS: (U) PE81102F, WJAFOSR2917AY.

ABSTRACT: (U) During the past year, work was continued developing novel advanced laser spectroscopy plasma diagnostic methods. The methods are based on observing the doppler shift in the absorption lines of ionic species. Two methods under study are Velocity Modulated Laser Spectroscopy and Two-Beam Doppler Shift Laser Spectroscopy. The scientific goal of the work is to increase understanding of plasmas by making in-situ measurements of ion drift velocities, concentrations and temperatures in a non-intrusive fashion. The scientific approach is to combine conventional laser spectroscopies with velocity detection. Using a method such as Rayleigh, fluorescence, or Raman scattering, one probes the Doppler profile of the specie of interest, observing shifts in the Doppler profile that arises because of the presence of a electric field. The shift may be related to the ion mobility, and thus conductivity, if the electric field is known, or to the electric field if the mobility is known. Temperature and concentration may be recovered by the conventional means. Keywords: Plasmas, Electric propulsion.

DESCRIPTORS: (U) \*DOPPLER EFFECT, \*IONS, \*LASERS, \*SPECTROSCOPY, ABSORPTION SPECTRA, DETECTION, DRIFT, ELECTRIC FIELDS, ELECTRIC PROPULSION, FLUORESCENCE, LIGHT SCATTERING, LINE SPECTRA, MEASUREMENT, MOBILITY, MODULATION, PROBES, RAMAN SPECTRA, VELOCITY.

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AD-A192 997 20/4

VIRGINIA POLYTECHNIC INST AND STATE UNIV BLACKSBURG DEPT  
OF AEROSPACE AND OCE AN ENGINEERING

IDENTIFIERS: (U) PE81102F, WJAFOSR2308A3.

(U) Experimental Study of Unsteady Separating Turbulent  
Boundary Layers.

DESCRIPTIVE NOTE: Final technical rept..

FEB 88 189P

PERSONAL AUTHORS: Agarwal, N. K.; Simpson, R. L.

CONTRACT NO. AFOSR-84-0134

PROJECT NO. 2307

TASK NO. A2

MONITOR: AFOSR  
TR-88-0271

UNCLASSIFIED REPORT

ABSTRACT: (U) A detailed experimental study of two large amplitude unsteady freestream flows and a third unsteady flow produced by an oscillating roof damper is reported. Detailed ensemble-averaged velocity and turbulence measurements were made using hot-wire and laser anemometers. While the primary function of this report is to present and document these data, some discussion of the results and a number of data plots are presented. The reduced data are available on computer diskettes. Upstream of detachment at the phases with no flow reversal, the flows are quasi-steady. For the large amplitude flows, at low velocity phases some flow reversal occurs upstream of detachment, which was not observed in the moderate amplitude flow studied by Simpson et al. (1983). After the beginning of detachment, large amplitude and phase variations develop through each flow. Huge backflow velocities, as large as free-stream, were measured. Keywords: Unsteady flows, Laser anemometry, Turbulence, Separation.

DESCRIPTORS: (U) \*TURBULENT BOUNDARY LAYER, \*UNSTEADY FLOW, \*FLOW SEPARATION, AMPLITUDE, BACKFLOW, DAMPING, DATA MANAGEMENT, DATA REDUCTION, LASER ANEMOMETERS, LOW VELOCITY, MEASUREMENT, OSCILLATION, PHASE, PLOTTING, REVERSIBLE, TURBULENCE, VARIATIONS, VELOCITY, FREE STREAM.

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AD-A192 965 20/7

HOT WIRE ANEMOMETERS, COMPUTER APPLICATIONS.

CORNELL UNIV ITHACA NY LAB OF ATOMIC AND SOLID STATE PHYSICS

IDENTIFIERS: (U) PE81102F, WUAFOSR2307A2.

(U) Design and Performance of an UHV Beamline to Produce Low and Hyperthermal Energy Ion Beams,

JAN 88 10P

PERSONAL AUTHORS: Adler, D. L.; Cooper, B. H.

CONTRACT NO. AFOSR-86-0088

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-88-0318

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Review of Scientific Instruments, v59 n1 p137-145 Jan 88.

ABSTRACT: (U) Construction and testing is reported for an UHV beamline to produce beams of alkali metal and noble gas ions over the energy range 20eV to 10keV with energy resolution  $\Delta E/E$  of 1% or better. At the sample position, we have attained tens of nanoamps of current for keV energy beams in a 1 - 2mm beam spot with about + or - 1 angular divergence, and nanoamps of current at 25eV in a 4-mm beam spot with + or - 2 angular divergence. By applying Liouville's theorem to the beam's emittance and using waist-to-waist transport through the beam optics, the current on the sample is maximized while limiting the spot size and angular divergence. To achieve useful current at the lowest energies, special attention was paid to minimizing space-charge effects. Beam emittances measured at the sample position are consistent with Liouville's theorem.

DESCRIPTORS: (U) \*PARTICLE BEAMS, \*MONOCHROMATORS, \*ION SOURCES, \*BEAM FORMING, ENERGY, HIGH TEMPERATURE, ION BEAMS, IONS, LIOUVILLE EQUATION, LOW ENERGY, OPTICS, RARE GASES, SIZES(DIMENSIONS), SPACE CHARGE, THEOREMS, REPRINTS, ALKALI METALS, PARTICLE ACCELERATOR COMPONENTS.

IDENTIFIERS: (U) WUAFOSR2303A2, PE81102F.

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AD-A192 958 11/6 11/4

WISCONSIN UNIV-MADISON DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERINGDREXEL UNIV PHILADELPHIA PA DEPT OF MATERIALS  
ENGINEERING(U) Equipment for Building and Testing Superconductive  
Flux Flow Electronic Devices.(U) A Fundamental Study of P/M Processed Elevated  
Temperature Aluminum Alloys.

DESCRIPTIVE NOTE: Final rept. 1 Nov 88-30 Nov 87,

DESCRIPTIVE NOTE: Annual rept. Oct 86-Dec 87,

NOV 87 4P

DEC 87

PERSONAL AUTHORS: Nordman, James E.; Beyer, James B.

PERSONAL AUTHORS: Koczak, Michael

CONTRACT NO. AFOSR-87-0081

CONTRACT NO. AFOSR-87-0012

PROJECT NO. 2917

PROJECT NO. 2917

TASK NO. A3

TASK NO. A3

MONITOR: AFOSR

MONITOR: AFOSR

TR-88-0303

TR-88-0305

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The equipment authorized by the grant is a thin film vacuum deposition system containing provisions for ion beam and magnetron sputter deposition and for ion beam etching.

ABSTRACT: (U) A key ingredient in the development of high performance composite and powder processed RST materials is the understanding of the processing/structure/property relationship. A vital part of this understanding is the independent control of material chemistry and processing coupled with the ability to exercise careful control of the temperature-time-pressure relationships during the consolidation of composite and powder processed structures. To this end, an equipment grant, requested for a high temperature vacuum industries vacuum hot press for the fabrication of metal and ceramic matrix composites as well as a Lipton/MT composite curing autoclave/press for the consolidation of resin matrix and hybrid composite systems. A salient feature is the capability to produce composite and powder processed samples of sufficient dimensions so that meaningful mechanical and structural evaluations can be performed. The combined systems, i.e. vacuum hot press, autoclave and laminating press, shall provide the research faculty with this state of the art capability for the processing advanced resin, ceramic and metal matrix composite structures as well as supporting on-going programs in rapid solidification technology and ceramics.

DESCRIPTORS: (U) \*ETCHING, \*SPUTTERING, \*VACUUM DEPOSITION, DEPOSITION, ION BEAMS, MAGNETRONS, THIN FILMS, SUPERCONDUCTORS, RESEARCH FACILITIES.

IDENTIFIERS: (U) WJAFOSR2917A3, PE61102F.

DESCRIPTORS: (U) \*ALUMINUM ALLOYS, \*CERAMIC MATERIALS.

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CONTINUED

\*COMPOSITE MATERIALS, \*MATRIX MATERIALS, AUTOCLAVES, CHEMISTRY, CONTROL, CURING, EXERCISE(PHYSIOLOGY), FABRICATION, HIGH TEMPERATURE, HOT PRESSING, HYBRID SYSTEMS, INSTRUCTORS, LAMINATES, MATERIALS, MECHANICAL PROPERTIES, METALS, POLYMERS, PRESSING(FORMING), PROCESSING, QUICK REACTION, SOLIDIFICATION, STRUCTURAL PROPERTIES, TEST AND EVALUATION, VACUUM.

IDENTIFIERS: (U) PE61102F, WUAFOSR2917A3.

IAC NO. MMC-702854

IAC DOCUMENT TYPE: MMCIAC - HARD COPY --

AD-A192 958 14/5 9/1 13/8

STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF PHYSICS  
(U) Equipment for an Advanced Electron Beam Lithography System.

DESCRIPTIVE NOTE: Final rept. 13 Jul 88-14 Jul 87.

JUL 87 4P

PERSONAL AUTHORS: Lukens, James

CONTRACT NO. AFOSR-88-0253

PROJECT NO. 2817

TASK NO. A3

MONITOR: AFOSR  
TR-88-0308

UNCLASSIFIED REPORT

ABSTRACT: (U) Equipment has been purchased under this grant to develop and build a research electron beam lithography (EBL) system at Stony Brook for the support of research projects on superconducting electronics. The system is based on an Array scanning electron microscope (SEM) which has been modified to accept a laser interferometer to monitor stage position. High precision nonmagnetic stages have been added, and interface electronics have been designed and built to permit control of the beam position and beam blanking by an external computer. The completed system is designed to write over a four inch wafer with a resolution of 30nm and a positional accuracy of 100nm.

DESCRIPTORS: (U) \*ELECTRON BEAMS, \*ELECTRONIC SCANNERS, \*LITHOGRAPHY, BEAM STEERING, COMPUTERS, ELECTRON MICROSCOPES, ELECTRONIC EQUIPMENT, ELECTRONICS, INTERFACES, MAGNETIC PROPERTIES, OPTICAL INTERFEROMETERS, POSITION(LOCATION), PRECISION, SUPERCONDUCTIVITY, CONTROL SYSTEMS, LASER APPLICATIONS, ELECTRONIC EQUIPMENT.

IDENTIFIERS: (U) Electron beam lithography,  
WUAFOSR2917A3, PE61102F.

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AD-A192 955 21/2 20/4

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF  
MECHANICAL ENGINEERING

(U) Premixed Turbulent Flame Propagation.

DESCRIPTIVE NOTE: Annual rept. 1 Nov 88-31 Oct 87.

JAN 88 15P

PERSONAL AUTHORS: Santavirta, D. A.

CONTRACT NO. AFOSR-87-0087

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-88-0288

UNCLASSIFIED REPORT

**ABSTRACT:** (U) Results are presented from an experimental study of premixed turbulent flame propagation under atmospheric pressure, unconfined conditions. Stoichiometric propane air flames at two turbulence conditions were studied. LDV was used to obtain ensemble averaged measurements of velocity, turbulence intensity and integral time scale through the propagating flame. The integral length scale ahead of the flame was obtained both directly from a two-point spatial correlation measurement and indirectly using Taylor's hypothesis. In addition, laser planar imaging was used to obtain two-dimensional flame structure measurements which were processed with a fractal analysis. Both the mean velocity and the turbulence were observed to change immediately ahead of the propagating flame. The mean velocity was found to decrease due to the unconfined nature of the flame and the turbulence intensity was found to increase due to the turbulence-flame interactions. Sudden increases in both the mean velocity and the turbulence intensity across the flame were observed, where the absolute increase in turbulence conditions. Similar results have been reported by other researchers. The integral time scale was observed to decrease ahead of the propagating flame but the changes behind the flame were inconsistent. Keywords: Premixed turbulent combustion, Turbulent flame propagation.

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DESCRIPTORS: (U) \*FLAME PROPAGATION, \*TURBULENCE, BAROMETRIC PRESSURE, COMBUSTION, CORRELATION, FLAMES, INTENSITY, LASERS, LENGTH, MEAN, MEASUREMENT, MIXING, OPTICAL IMAGES, PROPANE, SCALE, SPATIAL DISTRIBUTION, STOICHIOMETRY, TIME, TWO DIMENSIONAL, VELOCITY, FUEL AIR RATIO, TURBULENT FLOW, FLOW FIELDS.

IDENTIFIERS: (U) PE8102F, WUAFOSR2308A2.

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AD-A192 954 7/4 22/5

AD-A192 952 11/4

PHYSICAL SCIENCES INC ANDOVER MA

DREXEL INST OF TECH PHILADELPHIA PA DEPT OF MECHANICAL ENGINEERING

(U) The Use of Liquid Films for Spacecraft Survivability to Laser Radiation.

(U) A Comprehensive Study on Damage Tolerance Properties of Notched Composite Laminates.

DESCRIPTIVE NOTE: Final rept.,

DESCRIPTIVE NOTE: Final technical rept. 30 Sep 84-31 Dec 87,

MAY 87 3P

PERSONAL AUTHORS: Galb,

FEB 88 254P

CONTRACT NO. F48620-84-C-0102

PERSONAL AUTHORS: Wang, A. S.; Reddy, E. S.; Binlenda, W.; Zhong, U.

PROJECT NO. 3005

CONTRACT NO. AFOSR-84-0334

TASK NO. A1

PROJECT NO. 2302

MONITOR: AFOSR TR-88-0304

TASK NO. B2

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-88-0280

ABSTRACT: (U) This contains the results of a phase II SBRI program to investigate the concept of liquid film protection of spacecraft materials from laser interaction. The liquid film protection concept consists of using a reflective thin film coating over a graphitic substrate to reduce the absorbed laser energy and hence the degree of damage caused by the laser interaction. The required properties of thin film are: 1) it liquifies at temperatures substantially below that for substantial substrate vaporization, 2) its vaporization temperature is much higher than the substrate, and 3) the liquified film must allow the passage of substrate vaporization products through it without destroying the film coherence.

DESCRIPTORS: (U) \*LIQUIDS, \*SPACECRAFT, \*THIN FILMS, COATINGS, COHERENCE, DAMAGE, ENERGY, GRAPHITE, INTERACTIONS, LASER BEAMS, LASERS, MATERIALS, PROTECTION, REFLECTION, SPACECRAFT COMPONENTS, SUBSTRATES, SURVIVABILITY, TEMPERATURE, VAPORIZATION.

IDENTIFIERS: (U) WUAFOSR3005A1, PE81102F.

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UNCLASSIFIED REPORT

ABSTRACT: (U) This final report contains the results of an investigation on matrix-related damage mechanisms in notched composite laminates. The theoretical approach taken follows the principles of micromechanisms and the mechanics of brittle fracture at the descriptive level considered valid for the so-called ply-elasticity. Namely, the laminate is basically treated as a 3-dimensional elastic solid which is made of distinctly anisotropic layers. Brittle fracture can initiate and propagate within any layer having a weaker axis of material anisotropy, and within any one of the weaker layer interfaces due to the 3-dimensional interlaminar stresses. Owing to the particular microstructure of the laminate, growth of such sublaminate cracks constitutes a load- or time-dependent evolutionary process. A computer simulation methodology is developed to describe the modes and the extent of damage caused initially by the presence of the notch, and subsequently by the damages themselves. Experiment using a graphite-epoxy laminate is then conducted to validate the simulation results. Keywords: Graphite epoxy laminates, Notches, Holes, Stress concentration, Matrix cracks, Mixed modes, Crack growth, Finite element fracture mechanics.

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DESCRIPTORS: (U) \*EPOXY LAMINATES, \*FRACTURE(MECHANICS),  
\*COMPOSITE MATERIALS, ANISOTROPY, BRITTLENESS,  
COMPUTERIZED SIMULATION, CRACK PROPAGATION, DAMAGE,  
EVOLUTION(GENERAL), FINITE ELEMENT ANALYSIS, GRAPHITE,  
GRAPHITED MATERIALS, LAMINATES, LAYERS, MATERIALS,  
MECHANICS, METHODOLOGY, MICROSTRUCTURE, MIXING,  
SIMULATION, STRESS CONCENTRATION, TIME DEPENDENCE,  
TOLERANCE.

IDENTIFIERS: (U) \*Notched composite laminates, PE81102F,  
WJAF0SR2302B2.

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